

1.1 INTRODUCTION

- 1.1.1 The purpose of this Design Standards and Policies Manual is to inform developers and their designers of the planning and designing of public and private infrastructure and to provide an enhanced quality of life for Goodyear citizens and visitors. Design concepts and specific technical data are outlined, but are not intended to supersede sound engineering judgment. All plans are to be prepared with these concepts in mind, and will be reviewed accordingly.
- 1.1.2 This book is divided into individual sections, which cover specific elements of the design and development review process. It begins with general information, followed by specific technical details. Updates will be published and made available periodically.
- 1.1.3 These Design Standards are intended to be used in conjunction with the specifications of the Subdivision, Zoning, Floodplain, Grading and other appropriate ordinances of the City of Goodyear, and such other agencies as may have jurisdiction.
- 1.1.4 General Information
 - A. All development within the City of Goodyear shall comply with all requirements of the City of Goodyear Codes and Ordinances. Copies of these documents, with revisions, are on file in the Office of the Clerk of the City of Goodyear. Preliminary and final design plans shall be prepared in accordance with these standards unless specific variances have been approved by the City.
 - B. All construction shall be in accordance with the approved plans, the City of Goodyear Supplements and the Uniform Standard Details and Specifications published by the Maricopa Association of Governments (MAG) and City of Goodyear Supplements and as may be amended by the City as indicated herein.
 - 1. Engineering Plan Review

Once the plans for the development have been prepared, they shall be submitted to the City's Community Development Department. From there, they will be distributed to the appropriate City departments for their review and comment. These comments will be compiled and consolidated by the Community Development Department and returned to the developer. All such comments shall be incorporated into the plans and reports by the developer for resubmittal.

2. Right-of-Way
When required, the acquisition and dedication of new street right-of-way and/or utility easements shall be coordinated through the City. Deeds containing legal descriptions and scale drawing for these rights-of-way, easements and/or parcels shall be prepared by the developer and submitted to the City for approval and recording.
3. Street Lights
Street lights are required on all public streets within or adjacent to the proposed development per Section 15-4-4-M, Subdivision Regulations. Plans for these facilities must be included in the overall submittal.
4. Construction
Construction permits are required for all construction within the City. Any contractor found working on a project without an official set of approved plans and permit shall discontinue work. Prior to the issuance of a permit the developer shall provide the appropriate assurance of Construction for the off-site improvements per Section 15-4-6-F, Subdivision Regulations.

1.1.5 Policies Related To Development Improvements

- A. The following sections outline the City's policies related to various improvements associated with the development process. They are by nature general in scope. Reference should be made to the appropriate sections within the balance of these standards for specific details.

1. Street Improvement Policy
 - a. All developments within the City shall provide an interior street system adequate to insure that all parcels and/or facilities within the development shall have reasonable access to the balance of the public street system. Further, they shall provide access into the development for public service and/or emergency operations. Such facilities, be they public or private streets, shall be of such width and structural strength as to provide safe and unrestricted access.
 - b. In single-family developments it is the intent of the City of Goodyear that the street system be designed in conformance with current street classifications.

There shall be minimal direct access to the collectors, secondary streets, and extremely limited access to the arterials.

- c. When the development occurs adjacent to a boundary street, it is the City's policy that it shall be the responsibility of the developer to install improvements along their frontage to the ultimate grade and alignment for the said boundary street. This may include removal and replacement of the existing street surface to the centerline if that structure is inadequate to meet the current design standards. Street lighting, landscaping, and burial of overhead utilities, will be required, at the sole or substantial expense of the developer.

B. Storm Drainage Policy

1. It is the City's policy that all developments within the City shall provide sufficient retention so as to minimize the adverse impact of that development on its downstream neighbors. To that end, all development shall provide sufficient on-site retention to contain, at the least, the runoff generated by 100-year six-hour storm falling on that property. Such retention facilities shall be separate and distinct parcels within the development and shall be planned for accordingly. In single-family developments this facility may be turned over to the City for operation and maintenance, presuming it meets City requirements.
2. Further, it is the City's policy that all developments shall provide adequate drainage facilities so as to convey runoff, generated both on and off the project, around or through the project in such a manner as to insure that the structures will be free from flooding and that there is reasonable access for emergency and public service vehicles. The developer shall install storm sewers, channels and/or other physical improvements necessary to achieve this result.
3. The Drainage Design Manuals for Maricopa County; Volume I, Hydrology, shall be used to determine peak discharge volumes for design purposes and Volume II Hydraulics is to be utilized as a basis for design guidance and criteria.

C. Water Line Extension Policy

It is the City's policy that all development within the City shall

have an adequate and secure source of potable water. To that end the City has developed a comprehensive program for supplying municipal water. Therefore, unless specifically excepted in writing by the Public Works Director, all developments within the City shall be serviced by the City's potable water system. Further, the developer shall extend said system to and through the development as necessary to insure adequate supply to the development. If deemed necessary and appropriate, the developer shall extend the water distribution system to the extremities of the project so as to insure that more distant potential users shall have reasonable access to the City's water system.

D. Sewer Line Extension Policy

It is the City's policy that, unless specifically excepted in writing by the Public Works Director, all developments within the City shall provide for the discharge of domestic and other liquid waste into the municipal sewerage system. All developers shall be required to extend to and through their project a sewage collection system of a size sufficient to dispose of these wastes to the public system. When deemed appropriate and necessary, the developer shall extend the main trunk and/or collector lines to the upstream extremities of the project so as to provide reasonable access for potential upstream users to the City system.

E. Site Development Policy

It is the City's policy that all development within the City shall be designed and constructed in such manner as to provide a safe and pleasant environment for the current and future citizens of Goodyear. To that end, the appropriate standards have been established for site development to include: Public and/or private access for general and special uses; public water and sewerage systems; on-site and off-site drainage; landscaping; storm retention; street lighting and public utilities as may be required. The structures themselves are to be constructed in accordance with the Subdivision and/or Zoning Ordinance, the current adopted Uniform Building Code, Standard Specifications, and these standards, as appropriate.

F. Order of Precedence

It is not intended by these standards to repeal, abrogate, annul, or in any way impair or interfere with existing provisions of other laws or ordinances except those specifically repealed with private agreement, or with restrictive covenants running with the land to which the City is a party. Where these standards impose a greater restriction on land, buildings, or structures than is imposed or

required by such existing provisions of law, ordinance, contract, or deed, the provisions of these standards shall prevail.

G. Definitions and Abbreviations

The words, abbreviations, or phrases used in these standards may be found in the Maricopa Association of Governments Uniform Standard Specifications and Details for Public Works Construction. All other words or phrases shall be per the generally accepted meaning the English language.

2.1 CONSTRUCTION PLAN REQUIREMENTS

2.1.1 General Comments

- A. This chapter contains information to assist the consultant in the preparation of all construction plans and documents to be submitted to the City of Goodyear for approval.
- B. All plans shall conform to the latest revised copy of the City “Engineering Design Standards and Policies Manual”.
- C. Any deviation from the City’s “Engineering Design Standards and Policies” requires prior approval by the Plan Review Supervisor.
- D. All construction plans for Grading and Drainage, Streets, Water, Sewer, and Storm Drains shall be prepared per the standards set forth in these guidelines.
- E. If any plan submitted is not in compliance or has in the plan reviewer’s opinion excessive corrections the review may not continue and will be returned to the owner. Any plan submitted for review, even if discontinued, will be counted as a plan review submittal.
- F. All plans and reports shall be accompanied by a completed “Check List for Engineering Plan Review” and City of Goodyear “Engineering Plan Review Fee Schedule.” The Final Signature cover sheet, when requested, shall be accompanied by a completed City of Goodyear “Construction Permit Fee Schedule.” See forms at the end of “Administrative Section.”
- G. Four (4) sets of Water Plans, three (3) sets of Sewer, Paving and Storm Drain Plans, and two (2) sets of Drainage Reports and Grading and Drainage Plans are required for each submittal. The corresponding number of sets of plans and City redlines are required for all other submittals.

2.1.2 Plan Submittal Sequence

See Table 1, “Administrative Section.”

Master Plan (site, drainage, water and sewer plans and others as requested by City of Goodyear) should be submitted first.

An approved Site Plan shall be included in or submitted with Drainage Report and/or Grading and Drainage Plan.

Drainage Report¹
Grading and Drainage Plan¹

Paving Plan² (including striping plan and soils report)
Storm Drain Plan²

Sewer Plan³
Water Plan³

Any plan submitted out of sequence shall not be reviewed and shall be returned to the owner to be resubmitted after prerequisite plans and reports have been approved or as a minimum be “Substantially Complete.” (Only the Plan Reviewer shall make the determination of “Substantially Complete” status.

¹ May be submitted simultaneously

² May be submitted simultaneously. In addition, the Paving Plans may be submitted with or following the Grading and Drainage Plans.

³ May be submitted simultaneously

2.1.3 Redline Comments

All City redline comments must be corrected or clarified. If there is a discrepancy concerning a redline comment please call the Plan Review staff at (602) 264-6424. Each redline set of plans shall be returned with the next plan submittal. Changes made to the plans or report, other than corrections noted in the City’s redlines, shall be listed in detail with the location in plans clearly stated. Failure to identify additional changes shall result in return of plans with an additional review required.

2.1.4 Approval of Plans

When in the opinion of the plan reviewer the plans meet the requirements for approval, a reproducible mylar cover sheet will be requested. When submitting the cover sheet, one (1) full set of plans and one ½ scale set of drawings shall be included. In addition, a completed, “Construction Permit Fee Schedule” shall be submitted for permit approval.

Prior to the City of Goodyear approval signature, all other reviewing agencies shall have signed the cover sheet, i.e. LPSCO and/or Maricopa County Environmental Service Department. If the agency does not sign the cover sheet, a letter of their approval shall accompany the cover sheet with the letter date and signing party noted on the cover sheet.

2.1.5 Basic Plan Requirements

A. General Submittal Standards

1. Plans submitted for review shall have the appropriate professional (State of Arizona) seal, signature, and date on each sheet.
2. Plans shall be prepared on a 24" x 36" sheet size, with a min. 2" left border and min. 1/2" border on other sides.
3. All infrastructure improvements (i.e., water, sewer, grading) shall be submitted on separate sheets. Exceptions to this are:
 - a. Storm drain and paving may be on the same sheet (separate fees apply for each utility).
 - b. Water and Sewer may be on the same sheet (separate fees apply for each utility).
4. Plans shall be drawn to the following drawing scales:

Type of Plan	Horizontal Scale	Vertical Scale
Grading and Drainage Plan	1 inch = 40 feet	
Water (including Key Map) and Sewer Plans	1 inch = 20 feet	1 inch = 4 feet
Paving and Storm Drain Plans	1 inch = 20 feet	1 inch = 2 feet

Unusual situations may warrant the use of a non-standard drawing scale. Prior approval of the Public Works Director, or his designee, is required.

5. Minimum lettering and numbering size shall be 3/16" for manually drafted or 1/8" for mechanically produced letters, numbers, and symbols. Lettering size of pertinent construction information shall be 10 point. Lettering size of informational and supplemental information (i.e. property line dimensions) shall be 8 point. Lettering, numbering, and line work must be uniform and with clear definition to be retrievable after microfilming.
6. Plans shall be of a quality to allow microfilming. (i.e. line weight and letter size shall be easily read when reduced by 50%.) NOTE: Plans which in the opinion of City staff

cannot produce usable microfilm will not be accepted for review.

7. Plans shall be drawn with the drafting symbols presented in Maricopa Association of Governments Uniform Standard Details for Public Works Construction.
8. Plans submitted to the City for review shall be blue-line or blackline prints.
9. Plans submitted to the City for approval shall be original mylar drawings or photo-mylar copies of original drawings.
10. A master utility plan at 1 inch = 100 feet shall be submitted with the final construction plans. (This plan will also be updated with the "As-Built Drawings".)
11. Plans submitted for review shall be accompanied by an approved site plan, or preliminary plat, as applicable.
12. Incomplete submittal may result in rejection (i.e. nonconformance with this manual). The rejection of plans may count as a review. The next submittal may require payment of additional review fees.

2.1.6 Cover Sheet

- A. Cover Sheet Format and Information (See City of Goodyear Exhibit No. 7)
- B. An individual cover sheet with the following information is required for each type of improvement plan:
 1. Project name and description
 2. City Name: Below the title, include the words "Goodyear, Arizona".
 3. Developer's name, address, and telephone number
 4. Consultant's name, address, and telephone number
 5. Engineer's seal and signature (This is to be affixed on each sheet.)
 6. Vicinity map showing the project's location within the City limits (See City of Goodyear Exhibit No. 1)

7. Legal Description: Provide project property legal description. When a legal description is not feasible, list the township, range, section, and location.
8. Project Benchmark
Approved City benchmarks shall be used. (In areas that have been Master Planned and partially developed using a different elevation datum, the City Engineer may approve a project datum. If a project datum is approved, an equation to City datum shall be provided on each sheet of the plans.)
9. Additional Information
 - a. Include the following additional information on the cover sheet. (See City of Goodyear Exhibit No. 7)
 - (1) Approval block for signatures. (See City of Goodyear Exhibit No 6.)
 - (2) City project number or case number in border along right edge - 1/4" minimum lettering size. To be assigned at first review and shall be placed on all subsequent reviews by design engineer.
 - (3) City of Goodyear, General Construction Notes, as applicable.
 - (4) "Key-Map" shall be provided on multi-sheet plans to relate plan sheets to project locations and type of improvements. "Key-Map" scale shall be 1" = 20 feet horizontal. "Key-Map" scale must be sufficient to show all required information clearly (i.e. valves, fire hydrant, manholes, street signs, and drainage arrows). This may be shown on a Detail Sheet instead of the Cover Sheet.)
 - (5) Sheet Index.
 - (6) Estimate of Quantities (for work in public rights-of-way or easements) with construction items shown in units as required in the right-of-way permit fee schedule. If the project is to be developed in phases, the estimate of quantities shall indicate quantities for each phase.

A detailed, certified cost estimate shall be submitted for approval by the City.

- (7) Utility system ownerships.
- (8) Other agency approvals as required.
- (9) Zoning as it currently exists on the property.
- (10) Legend - for symbols, non-standard abbreviations, etc.
- (11) "Blue-Stake" note is required on all plans which include excavation of any type.

2.1.7 Detail Sheet

- A. A separate detail sheet may be provided at the discretion of the Consultant or when required by the City.
- B. The following information is required:
 - 1. General Notes, as directed in Section 2.1.6, shall be shown on this sheet.
 - 2. A typical cross section shall be shown for each street in street construction plans. The information required on a typical section is:
 - a. Dimensions
 - b. Street centerline and right-of-way line
 - c. MAG Standard Details and Specification
 - d. Pavement structural design
 - e. Trim and match to existing street
 - f. Existing and proposed utilities
 - g. Landscaped areas
 - 3. Special construction details as required shall be provided. Typically this would include:
 - a. Modification or relocation detail for existing irrigation structures.

- b. Special construction required where utility locations conflict.
- c. Others determined by the Consultant and/or the City as needed to clarify construction. Presentation of Design and Construction Information

C. General

- 1. Plan layout, graphics, and call-outs must be clearly presented in an uncluttered manner acceptable to the Plan Review Department and Public Works Director, or his designee.
- 2. Callout shall be boxed narrative text call-outs (See City of Goodyear Exhibit No. 8)

Numeric style call-outs shall only be used with prior approval of the Public Works Director, or his designee. When used each number shall relate to the same topic for the entire set of plans and narrative call-outs shall be grouped and clearly shown on every page that the callout is used. Stationing and offset shall accompany every applicable callout number (See Exhibit No. 8).

- 3. Plans shall show only one utility (i.e. water, sewer, storm drain, grading and drainage, or paving) on the plans at a time, in bold, for review. All other infrastructure, existing and future, shall be shown lighter (smaller pen width or dashed) for reference only (minimum bold line weight: 0.70 mm; minimum light line weight: 0.30 mm). Exceptions to this are:
 - a. Storm drain and paving may be on the same sheet (separate fees apply for each utility).
 - b. Water and Sewer may be on the same sheet (separate fees apply for each utility).
- 4. Plans shall provide cross-referencing between all sheets which have details, detail call-outs, notes, etc.
- 5. Plans shall be oriented with north at the top or right side of each sheet whenever possible. A north arrow and bar scale shall be provided.

D. “As-Built”

1. Mylar drawings are required to be provided to the City for “As Building” of construction within public rights-of-way or within easements dedicated to the City. Only original (4 mil) mylar drawings or photographic (4 mil) mylars are acceptable. Digital Mylars are an acceptable alternate if submitted with a disk or CD copy.

2.1.8 Reports and Other Documents

A. Reports and other submitted documents must include the following:

1. All reports and documents shall have the appropriate (State of Arizona) professional seal, signature, and date.
2. All reports and documents shall be provided on 8-1/2” x 11” format. Larger size exhibits may be included, provided they are secured inside.

2.1.9 “Special Plan” Requirements

A. Haul Route Plan/Permit

1. Estimated dirt hauls of 5,000 cubic yards or more that require use of the public right-of-way shall obtain a “Haul Route/Encroachment Permit”.
2. Estimated dirt hauls of less than 5,000 cubic yards may require a “Haul Route/Encroachment Permit” as determined by the City Public Works Director, or his designee.
3. The Public Works Director, or his designee, will stipulate, review, and approve:
 - a. Haul routes
 - b. Allowed travel times
 - c. Traffic control requirements
 - d. Dust control requirements
 - e. Restoration procedures
 - f. Safety procedures
 - g. Possible additional requirements

- B. Traffic Control Plans
The Public Works Director, or his designee, will stipulate, review and approve all traffic control plans for construction. An approved traffic control plan shall be required prior to any traffic control device installation within the Public Right-of-Way.

2.1.10 Plan View Only Sheets

- A. Plan view only is allowed for construction plans for:
1. Minor collector and interior streets in undeveloped areas
 2. Grading and Drainage Plan with supplemental cross sections as needed to explain drainage
 3. Water line plans for new subdivisions with pipe size under twelve (12) inches in diameter
 4. Street light plans
- B. The following information is required:
1. Plan view shall be oriented such that north is either at the top or the right side of the sheet. North shall be clearly indicated for each plan view.
 2. The drawing scale shall be clearly indicated for each plan view, and a graphic scale at least 2 inches long or 100 scale feet, shall be placed adjacent to each north arrow.
 3. All existing topography shall be shown. Typically this will include:
 - a. Existing contours with adequate spot elevations to show drainage
 - b. Existing utilities - aerial and underground
 - c. Existing irrigation facilities
 - d. Adjacent land uses
 - e. City limits where applicable
 - f. 100 year floodplain limits where applicable
 - g. 100 year floodway limits where applicable
 4. Existing and proposed right-of-way, easements, view-easements and property lines. Dimensions of these shall be clearly indicated.

5. Drafting and lettering of new construction shall be sufficiently heavier (darker) than existing topography so as to allow it to be quickly and clearly identified.
6. New construction notes SHALL BE BOXED so that they contrast with general information notes.
7. New drainage slopes may be shown as a percentage of slope or in foot per foot change of grade.
8. Grade breaks shall be clearly shown.
9. "Blue Stake" notes shall be provided on each sheet.

2.1.11 Plan and Profile Sheets

- A. Plan and Profile are required for construction plans for:
 1. All arterial and secondary collector streets plus other streets when longitudinally matching existing streets.
 2. Water line plans for construction within existing streets.
 3. Water line plans for construction with pipe size twelve (12) inches in diameter or greater.
 4. All sewer line plans
 5. All effluent line plans
- B. The following information is required:
 1. Plan view shall be prepared in accordance with 2.1.11
 2. Profile view shall show the following:
 - a. Elevation and stationing grid clearly indicated.
 - b. Profile of existing surface over proposed construction.
 - c. Existing utility crossings.
 - c. Proposed construction (i.e. elevations, slopes, grade breaks).
 4. New construction notes SHALL BE BOXED so as to contrast with general information notes.
 5. Where the sanitary sewer is approved to be less than five feet deep, the proposed water line shall be indicated in profile by

a "ghost" line, and the building sewers shall be plotted at the locations and inverts where they cross the water line. The MAG Std. Detail 404 shall be called out, when needed, on both plan and profile.

- C. Double plan and profile shall only be permitted with written approval by the Plan Review Department or the Public Works Director, or his designee.

- 2.1.12 ALL plans for construction within City right-of-way or easements shall have the following shown on either the Cover Sheet or the Detail Sheet.

CITY OF GOODYEAR
GENERAL NOTES FOR CONSTRUCTION

- A. All construction shall conform with the latest MAG standard Details and Specifications and the City's Supplemental Details and Specifications.
- B. This set of plans has been reviewed for compliance with City requirements prior to issuance of construction permits. However, such review shall not prevent the City from requiring correction of errors in plans found to be in violation of any law or ordinance.
- C. The City does not warrant any quantities shown on these plans.
- D. The City approval is for general layout in the right-of-way only. This approval is valid for a period of one year. Construction permits shall be obtained during this period or the plans shall be resubmitted for review and approval.
- E. An approved set of plans shall be available on the job site at all times.
- F. The City shall be notified 24 hours prior to any construction work and inspections. (932-1637) Construction work concealed without inspection by the City shall be subject to exposure at the contractor's expense.
- G. Right-of-way improvements shall not be accepted until "As-Built" plans have been submitted and approved by the City. (See as-built requirements)
- H. The developer is responsible for the removal or relocation of all obstructions within the right-of-way prior to starting new construction.
- I. The developer is responsible for arranging the relocation and associated costs of all utilities. A utility relocation schedule shall be submitted prior to the issuance of permits.
- J. The developer is responsible for obtaining or dedicating all required rights-of-way and easements to the City prior to issuance of permits.
- K. The contractor shall contact BLUE STAKE (263-1100) at least 48 hours prior to construction.
- L. The contractor shall barricade construction sites at all times per the City of Phoenix Traffic Barricade Manual. When required by the City, a traffic control plan shall be submitted for approval in advance of construction.
- M. The contractor may request a fire hydrant meter for construction water from the Finance Department. This meter should be ordered two working days prior to the start of construction. The unlawful removal of water from a fire hydrant is a violation of the municipal code, punishable by fine and/or imprisonment.
- N. Private on-site water and sewer lines shall be constructed in accordance with the Uniform Plumbing Code, N.F.P.A. and the Uniform Fire Code as adopted by the City.

- 2.1.13 All plans for street construction within right-of-way or easements shall have the following shown on either the Cover Sheet or the Detail Sheet.

CITY OF GOODYEAR

GENERAL NOTES FOR STREET CONSTRUCTION

- A. All construction shall be in accordance with current MAG specifications and standard details.
- B. Contractor shall obtain all necessary permits prior to construction.
- C. City of Goodyear inspectors shall be notified 24 hours prior to starting each phase of construction, and each inspection requested (932-1637).
- D. Any work performed without the approval of the City Engineer, and any work/material not in conformance with the specifications is subject to removal and replacement at the contractor's expense.
- E. Contractor will expose any lines being tied into to verify location.
- F. Construction shall have all existing underground utilities located (Bluestake - 263-1100) and shall eliminate all conflicts prior to construction.
- G. City of Goodyear is not liable for delays nor damages to utilities related to this construction; neither will the City participate in the cost of utility construction nor relocation.
- H. As-built drawings (one set mylars and two sets of prints), certified by the subdivider's engineer, shall be submitted to and accepted by the City Engineer before final acceptance of the work. (See as-built requirements.)
- I. Contractor shall continuously reference location of all valves during construction.
- J. All underground utilities located in the roadway shall be completed before paving.
- K. Base course shall not be placed until subgrade has been approved by City Engineer.
- L. Gutters shall be water tested for drainage in the presence of the City Engineer.
- M. Exact point of matching termination and overlay shall be determined in the field by the City Engineer.
- N. Curb, gutter, sidewalk, and pavement shall be swept clean of dirt and debris.
- O. Contractor shall provide dust control to the satisfaction of the City Engineer. The Contractor shall obtain an air pollution permit from the Maricopa County Air Pollution Control.
- P. Contractor is to install a blue reflector at all fire hydrant locations. Reflector to be glued to the finished paving at the specified location. (See Section 5.1 Potable Water System Design and Detail G-3212)

- 2.1.14 All plans for water main construction within right-of-way or easements shall have the following shown on either the Cover Sheet or the Detail Sheet.

CITY OF GOODYEAR
GENERAL NOTES FOR WATER MAIN CONSTRUCTION

- A. All Construction shall be in accordance with current MAG specification and standard details.
- B. Contractor shall obtain all necessary permits prior to construction.
- C. City of Goodyear inspectors shall be notified 24 hours prior to starting each phase of construction, and each inspection requested (932-1637).
- D. Any work performed without the approval of the City Engineer and any work/material not in conformance with the specifications is subject to removal and replacement at the contractor's expense.
- E. Contractor will expose any lines being tied into to verify location.
- F. Contractor shall have all existing underground utilities located (BLUE STAKE-263-1100) and shall eliminate all conflicts prior to construction.
- G. City of Goodyear is not liable for delays nor damages to utilities related to this construction; neither will the City participate in the cost of utility construction nor relocation.
- H. As-Built drawings (one set mylars and two sets of prints), certified by the subdivider's engineer, shall be submitted to and accepted by the City Engineer before final acceptance of the work.
- I. Backfilling shall not be done until lines are inspected and approved by the City Engineer.
- J. Valves shall be furnished and installed by the contractor according to MAG and C.O.G supplements. Approved valves list is available at the Public Works Department.
- K. Back flow preventor shall be furnished and installed by the contractor according to MAG and C.O.G. supplements. Approved valves list is available at the Public Works Department.
- L. Fire hydrants shall be furnished and installed by the contractor, and shall be painted chrome yellow after installation. Approved fire hydrant list is available at the Public Works Department
- M. All service lines shall be type K copper pipe or tubing. The minimum size service shall be one-inch. Service lines shall be continuous under pavement without a connection or extension.
- N. All taps shall use all bronze double strap service saddle.
- O. Developer is to install all taps and meter boxes. The tap shall terminate with an angle meter valve within the box set 6 inches behind the sidewalk and 8 inches below the back of the sidewalk. The meter box shall be set flush to the ground at the back of the sidewalk and at property line where sidewalks do not exist. The meter box and lid shall be cast iron Ford Meter Box Model No. YM HC 241-243-T-G for 1 inch service and FPMB-7-T for 1 1/2 inch or two inch service suitable for the installation of a Sensus Touch Read Model meter.
- P. Meters shall be furnished and installed by utility agency. All meters shall be Sensus Touch Read Model.

- Q. Pavement replacements shall be made to MAG standard details.
- R. All water service connections shall be extended a sufficient distance across right-of-way to clear all facilities to be installed in public utility easements paralleling street right-of-way.
- S. Fire hydrant pumper connection covers shall be painted in accordance City standards (See Detail G-3330).

- 2.1.15 All plans for sewer main construction within right-of-way or easements shall have the following shown on either the Cover Sheet or the Detail Sheet.

CITY OF GOODYEAR

GENERAL NOTES FOR SEWER MAIN CONSTRUCTION

- A. All Construction shall be in accordance with current MAG specification and standard details.
- B. Contractor shall obtain all necessary permits prior to construction.
- C. City of Goodyear inspectors shall be notified at (932-1637) 24 hours prior to starting each phase of construction and each inspection requested.
- D. Any work performed without approval of the city engineer, and any work/material not in conformance with the specifications is subject to removal and replacement at the contractor's expense.
- E. Contractor will expose any lines being tied into to verify location.
- F. Contractor shall have all existing underground utilities located (BLUE STAKE-263-1100) and shall eliminate all conflicts prior to construction.
- G. City of Goodyear is not liable for delays nor damages to utilities related to this construction; neither will the City participate in the cost of utility construction nor relocation.
- H. As-Built drawings (one set mylars and two sets of prints), certified by the subdivider's engineer, shall be submitted to and accepted by the City Engineer before final acceptance of the work.
- I. Backfilling shall not be done until lines are inspected and approved by the City Engineer.
- J. Pavement replacements shall be made to MAG standard details.
- K. PVC sewer pipe may be used as an alternative for vitrified clay sewer pipe in accordance with MAG specification Section 745 for sizes through 15-inch with the following addition: 745.8 installation and testing: installation must also comply with standard specification (ASTM D 2321.) Short term deflection testing shall be performed on the total footage, after complete backfill and compaction, but prior to the installation of finish surface material. Additional testing may be required. A short term deflection in excess of 5 percent shall be considered unserviceable and shall be repaired or replaced and retested.
- L. A visual inspection of the interior of the sewer line using a television camera will be performed on the total footage of all sewer lines, after complete backfill and compaction, but prior to the installation of finish surface material. Any portion considered unserviceable by the City shall be repaired or replaced at no additional cost to the City and retested. A VCR tape of the sewer line and report of observations shall be provided to the City for inspection and permanent record. All expenses for visual inspection using television camera is the responsibility of the contractor.
- M. All manhole rings and lids to be cast iron, lids to be imprinted "CITY OF GOODYEAR SANITARY SEWER".
- N. All taps shall be wye type.
- O. Sewer taps should be min. 4.5' deep at property line.

- P. All sewer service connections shall be extended a sufficient distance across right-of-way to clear all facilities to be installed in public utility easements paralleling the right-of-way.

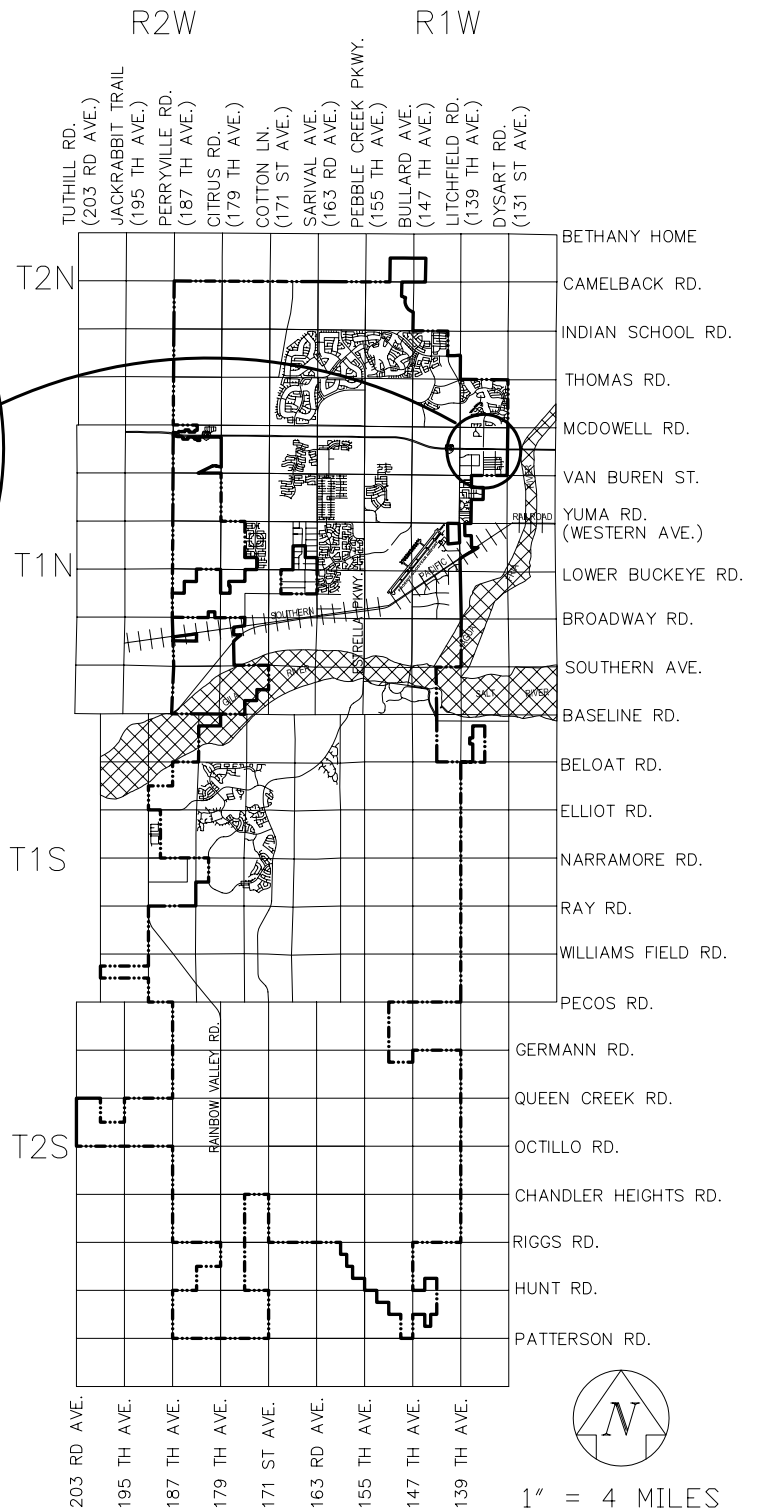
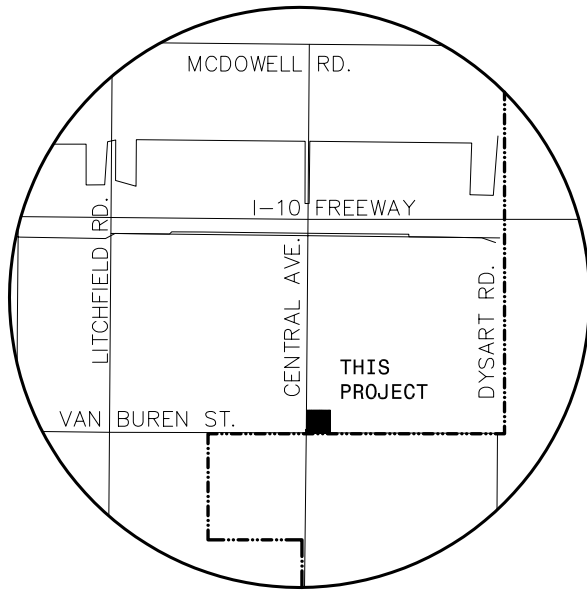
- 2.1.16 All plans for on-site Grading and Drainage construction shall have the following shown on either the Cover Sheet or the Detail Sheet.

CITY OF GOODYEAR

GENERAL NOTES FOR GRADING AND DRAINAGE CONSTRUCTION

- A. An on-site grading permit is required.
- B. A separate permit is necessary for any off-site construction.
- C. City of Goodyear inspectors shall be notified at (932-1637) 24 hours prior to starting each phase of construction and each inspection requested.
- D. Finish floor elevations shall be a minimum of 14" above point of outfall. Carport elevations shall be 4" below finish floor elevation. Lots shall be designed to the street at a grade no less than 1.0%.
- E. Staking pad and/or finished floor elevations are the responsibility of the developer or his engineer. In a critical drainage area (FEMA Zones A, AO, AH, A1-A33, and A99), certification of the finished building floor or stem wall elevation shall be submitted and approved prior to any vertical construction. In non-critical areas, the developer's engineer shall submit certifications of constructed building pad elevations prior to the City's acceptance of project.
- F. The grading contractor shall designate the location for wasting spoil materials and a letter from the owner giving permission for said disposal prior to starting on-site construction.
- G. Grading and drainage plan approval includes: construction of drainage plan including, but not limited to, retention and detention areas and/or other drainage facilities, surface grading, walls, curbs, asphalt pavement, and building floor elevations.
- H. The contractor shall provide all retention and detention basins at elevations as shown on the plans. Retention basins side slope shall not exceed 4:1 on private property or 6:1 adjacent to public right-of-way. Retention basins shall not exceed 3 foot depth on private property or 1.5 foot depth within 10 feet of public right-of-way.
- I. The contractor is responsible for locating and confirming depth of all the existing utility lines within proposed retention basin areas. If the basin cannot be constructed per plan as a result of conflict with underground utilities, the contractor should contact the City and designer and request modification of the basin design.
- J. This set of plans has been reviewed for compliance with City requirements prior to issuance of construction permits and shall be kept at the construction site. Such review shall not prevent the City from requiring correction of errors in plans which are found to be in violation of any law or ordinance.
- K. You are hereby advised that no person shall use any mechanical equipment for land leveling or clearing, road construction, trenching, excavating, demolition or engage in any earthmoving activity without first obtaining a permit from Air Pollution Control, Maricopa County Department of Health Service's 1001 N. Central Ave., Ste. 150, Phoenix, AZ 85003, Phone: 506-6666. (This notice is issued pursuant to A.R.S. 36-779.07, Notice of Building Agencies.)

- L. "As Built" drawings (one set mylars 2 sets of prints), certified by the developer's engineer, shall be submitted and approved prior to issuance of a building "Certificate of Occupancy".



VICINITY MAP

REQUIRED ON:

APPROVAL BLOCK

ALL PLANS:	Approval block as shown on sheet 2
ALL PLANS:	<p>"I HEREBY CERTIFY THAT THIS DESIGN IS BASED ON ACCURATE FIELD DATA WHICH HAS BEEN CHECKED IN THE FIELD PRIOR TO SUBMISSION FOR CITY APPROVAL. "</p> <p>BY: _____ DATE _____</p>
ALL PLANS: AS- BUILT APPROVAL:	<p>"AS- BUILT CERTIFICATION"</p> <p>I CERTIFY THAT THE "AS- BUILT" INFORMATION SHOWN HEREON WAS OBTAINED UNDER MY DIRECT SUPERVISION AND IS CORRECT AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.</p> <p>NAME _____ (SEAL) REGISTRATION NO. _____ DATE _____ REVIEWED BY: _____ FIELD ENGINEERING</p>
WATER & SEWER PLANS:	<p>BY: _____ DATE _____</p> <p>MARICOPA COUNTY ENVIROMENTAL SERVICES DEPT.</p>
FINAL PLATS:	<p>APPROVED BY THE CITY COUNCIL OF THE CITY OF GOODYEAR, ARIZONA THIS ____ DAY OF _____, 20__.</p> <p>BY: _____ ATTEST: _____ MAYOR (NAME PRINTED) CITY CLERK (NAME PRINTED)</p>

CITY OF GOODYEAR			
REVIEW AND RECOMMENDED APPROVAL BY:			
FIRE DEPT.		GRADING & DRAINAGE	
LANDSCAPING & PLANNING		WATER & SEWER	
TRAFFIC		PAVING	
APPROVED BY: <div style="display: flex; justify-content: space-between; border-top: 1px solid black; margin-top: 20px;"> PROJECT REVIEW SR. ENGINEER DATE </div>			

RE – APPROVAL	
REVIEW AND RECOMMENDED APPROVAL BY:	
<div style="display: flex; justify-content: space-between; border-top: 1px solid black; margin-top: 20px;"> PLAN REVIEWER DATE </div>	
APPROVED BY: <div style="display: flex; justify-content: space-between; border-top: 1px solid black; margin-top: 20px;"> PROJECT REVIEW SR. ENGINEER DATE </div>	

LANDSCAPE PLAN APPROVED CITY OF GOODYEAR		
<div style="border-top: 1px solid black; margin-top: 20px;">HTE NO.</div>	<div style="border-top: 1px solid black; margin-top: 20px;">APPROVAL BY:</div>	<div style="border-top: 1px solid black; margin-top: 20px;">DATE</div>
CONSTRUCTION AND INSTALLATION SHALL BE IN ACCORDANCE WITH THIS PLAN AND ANY AND ALL DEVIATION WILL REQUIRE REAPPROVAL. LANDSCAPE INSTALLATION TO BE APPROVED BY CITY OF GOODYEAR INSPECTION SERVICES BEFORE CERT. OF OCCUPANCY IS ISSUED.		

XYZ SUBDIVISION
SEWER IMPROVEMENT PLANS
GOODYEAR, ARIZONA

CITY OF GOODYEAR
GENERAL NOTES

VICINITY MAP

OWNER/DEVELOPER
NAME, ADDRESS
TELEPHONE NUMBER

ZONING

UTILITY COMPANIES

LEGAL
DESCRIPTION

ARCHITECT
NAME, ADDRESS
TELEPHONE NUMBER

SHEET INDEX

BENCHMARK

QUANTITIES

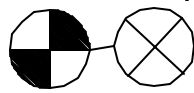
MARICOPA COUNTY
HEALTH DEPT. APPROVAL

ENGINEERING COMPANY
NAME, ADDRESS
TELEPHONE NUMBER

CITY OF GOODYEAR			
REVIEW AND RECOMMENDED APPROVAL BY:		SEAL	
DATE	NAME	DATE	NAME
APPROVED BY:	DATE	APPROVED BY:	DATE

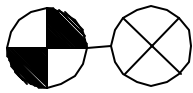
City of Goodyear
H.T.E. # 00-0000
SHEET NO.

XYZ SUBDIVISION
SEWER PLANS



STA. 73+50 20' RT.
 12" X 6" FLG. SQ. TEE
 6" FLG. X MJ VALVE W/ B&C(A)
 10' D.I. PIPE
 6" FIRE HYDRANT

STANDARD NOTE CALLOUT FOR PLANS



③ STA. 73+50
 20' RT.

③ 12" X 6" FLG. SQ. TEE
 6" FLG. X MJ VALVE W/ B&C(A)
 10' D.I. PIPE
 6" FIRE HYDRANT

Call out note shall clearly appear on every sheet the call out appears.
 Call out and note shall be the same for the entire set of plans.

ALTERNATIVE NOTE CALLOUT FOR PLANS*

*Prior written approval of the Public Works Director
 and Plan Review Supervisor required.

3.1 INTRODUCTION - STORMWATER MANAGEMENT

3.1.1 These policy statements are standards and interpretations made to assist in the implementation of the requirements of the ordinance. These policies are to be followed unless adequate documentation is submitted to and approved by the City Engineer that demonstrates that the intent and requirements of the ordinance will still be met.

3.1.2 Definitions

- A. ***Adjacent Grade:*** the elevation of the ground, sidewalk, patio, deck support, or basement entryway immediately next to the structure.
- B. ***The 100-Year Flood:*** a flood with a one percent chance of being equaled or exceeded in any given year. Throughout the United States, the standard for floodplain management is protection from flooding up to and including the 100-year flood event. In hydrology the 100 year flood is determined statistically from long term records of streamflow or rainfall data. The availability of useful streamflow data for estimating the 100-year flood in most parts of Arizona is very limited. Therefore, the value is generally estimated from rainfall records. Statistical methods are used to predict the 100 year rainfall amount that is then input into hydrologic watershed models. The hydrologic model then predicts the peak rates of runoff for that amount of rainfall. This approach assumes that: the 100-year- rainfall produces a 100-year flood; weather characteristics remain constant; and the watershed and channel characteristics are correctly modeled and they remain constant.

Inherent in the statistical estimating procedure is that as additional data records become available and are added to the data base the estimated size or frequency of a specific flood can change. The often heard comment: "we have had three 100 year storms in the past two years" is statistically possible. This should be expected and is not unusual when working with a relatively short data base in the arid southwest. Rainfall and runoff events are infrequent and highly variable in the arid regions of the Southwest. Therefore, they are also more difficult to measure and predict than in the more humid regions of the Southwest and the more humid regions of country.

3.1.3 Drainage Characteristics

A. Drainage Easements:

Drainage easements should be identified as early as possible, in the planning of any development project, preferably as part of the master plan process. The City will check for and avoid discontinuous drainage easements. For a variety of reasons only a small percentage of the drainage easements needed to cover all the washes and channels in the City have been dedicated and recorded. As a result, many discontinuous drainage easements exist throughout the City. The protection and proper operation and maintenance of these wash corridors are greatly complicated by the lack of continuous and complete drainage easements along these corridors. Maintenance is generally the responsibility of the individual property owner or the Homeowners Association. The recorded plat and grading and drainage plan should specify maintenance responsibility.

3.1.4 Design Procedures and Criteria

A. Drainage Policy

City of Goodyear requires 100% retention of all on-site storm water runoff for the entire site's ultimate development for the 100 year six (6) hour storm.

B. Alluvial Fan Development Policy

1. Introduction

- a. The purpose of this policy statement is to clarify development issues and requirements on alluvial fans for subdivisions and single family homes. These areas were mapped by the Federal Emergency Management Agency (FEMA) and identified as alluvial fan AO Zones on Flood Insurance Rate Maps (FIRMs) Several other large, unmapped areas in south Goodyear are also subject to similar alluvial fan flood hazards. Because, it is essential that the special requirements in alluvial fan flood zones are clearly understood and adhered to in all development projects.
- b. Development can occur on an alluvial fan or FEMA designate AO Zone, however, development must be carefully planned, designed, and constructed in accordance with FEMA and COG regulations. This

is due to the hazards associated with: the peak discharges and volumes of water; debris and sediment; potential erosion and scour; and possible relocation of the flow paths characteristic of alluvial fan flooding.

- c. There are two primary concerns in the planning and design of any development within an alluvial fan. First is the safety and protection of the residents and property within the proposed development. Second is the potential adverse effect on adjacent and downstream residents and property owners.

2. Development Requirements

- a. The following information on the development requirements on Alluvial Fans is a summary of requirements. This summary is based on a review of the City's Floodplain and Drainage Ordinance; common drainage law; FEMA rules and regulations; and the City's Bullard Wash Open Space Project. This is not necessarily inclusive of all the requirements of applicable Federal, State or local laws or regulations. None of the following eliminates the need to comply with any laws or regulations not specifically mentioned herein. Following these requirements is also not a guarantee against flooding. Floods larger than the design flood addressed in this policy can and will occur from time to time.
- b. These are two conditions under FEMA and COG Floodplain and Drainage Ordinance regulations in which development can occur in a mapped alluvial fan flood hazard (AO) zone by meeting all FEMA requirements for a map revision. The first method is for the proposed development to remove itself entirely from the AO zone by meeting all FEMA requirements for a map revision. The second is to provide the specific flood protection measures required on alluvial fans by FEMA and COG Ordinance without revising the map and obtaining required flood insurance. The following is a summary of the requirements associated with the two conditions.

3. Removing the Project Area from the AO Zone, via a FEMA Map Revision
 - a. The only basis for a map revision on an alluvial fan acceptable to FEMA are: “major structural flood control measures”. The design and construction must be supported by sound engineering analyses that demonstrate that the measures will effectively eliminate the alluvial fan flood hazards. Revisions based on fill are not acceptable by FEMA on alluvial fans.
 - b. FEMA requires engineering analyses that quantify the discharge and volume of water, debris, and sediment associated with the 100-year flood. This must be done at the alluvial fan apex under current and potential adverse watershed conditions. It must be shown that the proposed measures will effectively eliminate alluvial fan flood hazards from the fan area.
 - c. The standard minimum FEMA freeboard requirement for flood control structures on an alluvial fan is three to four feet, depending on the proximity to bridges, etc. The City will require engineering analysis that demonstrates to FEMA’s satisfaction, that adequate protection will be provided. A lesser freeboard is possible; however, FEMA will not accept a freeboard of less than two feet.
 - d. Another FEMA requirement is that the City of Goodyear must assume ultimate responsibility for all operation and maintenance activities for the flood control measures. This could be accomplished in a variety of ways, such as utility or improvement districts, homeowner’s association or contracting to the County Flood Control District.
 - e. The proposed development must address the impact of the project on flood hazards in the flood hazard area (other areas of the fan), as well as adjacent or downstream areas.
 - f. The time required for FEMA approval can be significant, depending on the complexity of the situation.

- g. Homeowners would no longer be required to purchase flood insurance under this development option, once FEMA approved the map revision.
- 4. Development Without Removal from the AO Zone Designation:
 - a. Under this approach, homeowners are still required to buy flood insurance if they have a federally insured mortgage. They must also meet all the criteria listed below.
 - b. Proposed building sites (single family residence or subdivision) must be reasonably safe from flooding from the 100 year event.
 - c. Residential structures must have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on FEMA's Flood Insurance Rate Map (FIRM). If no depth is specified on the FIRM a minimum of two feet above the highest adjacent grade is required.
 - d. Adequate drainage paths must be provided around structures on slopes, to guide floodwaters around and away from proposed structures. Structures should not be located in natural low areas or in wash bottoms.
 - e. The proposed development must address the impact of their project on flood hazards in the flood area (other areas of the fan), as well as on adjacent or downstream areas beyond the mapped AO Zone.
 - f. Any property below an alluvial fan apex, that has not been structurally contained, must protect its upstream perimeter with structural flood control measures. These measures must be designed to withstand the entire flow quantities at the apex, plus any intervening flows, based on current existing watershed conditions. This criterion assumes that run off from the upstream watershed will not increase in the future.
 - g. The design flow quantities for the perimeter protection may be adjusted if it can be demonstrated

by sound engineering analyses that the actual quantities that could reach the perimeter of the development are different from those at the apex. City Drainage Planning Staff must be consulted first for guidance and approval of the approach and methodology. Some general guidelines have been developed and are available from the City's Drainage planning staff.

5. Property Adjacent to one of the City's proposed Bullard Wash Open Space Project (BWOSP) channels, the Gila River or Riparian Habitats.
 - a. On property that contains any portion of one of the City's proposed BWOSP channels, the Gila River or Riparian Habitats, that develops prior to the installation of the project, the owner may be required to, as part of their development costs, dedicate the necessary Drainage Easement and construct the flood control structures that are a portion of the BWOSP, the Gila River or Riparian Habitats on their property.

C. Summary of Drainage Design Policy Guidelines
The following policy guidelines are based on recurring drainage and flooding problems observed in Goodyear related to specific design or construction practices:

1. Subdivisions
 - a. A subdivision should always have an approved subdivision-wide drainage plan. Drainage based on individual lots submitting separate grading plans as each lot is developed should be avoided.
 - b. Avoid design of a common drainage facility that requires maintenance by individual property owners. Put the drainage facility in a common Tract with the Homeowner's Association responsible for maintenance.
2. Storm Drains
 - a. Avoid if at all possible the interception of the flow in an offsite natural wash with the intent of collecting it and putting it into a pipe or an underground storm sewer system.

- b. Washes and even man-made channel carry a never ending supply of sediment and debris. It is almost impossible to collect and filter out this debris without a constant clogging and maintenance problem. If there is no alternative to the routing of an open channel into a piped system, water should be first routed into a sediment or debris basin. Periodic maintenance of the debris basin should be planned.

3. Culverts

- a. Culverts should not be placed more than 0.5 feet below the natural wash invert, or the capacity must be reduced by the cross section area below this depth.
- b. Culverts or homemade bridges for private driveways or walkways over washes or drainage channels whose source originates off-site or off-lot should be designed by a professional drainage designer.
- c. Small drainage structures not designed with any hydrologic and hydraulic analysis may be OK for crossing channels originating onsite (on-lot). However, homemade drainage structures can be disastrous for the homeowner, his neighbors, and adjacent streets if installed on larger washes originating offsite (off-lot), therefore in this situation, dip crossings or free span bridges which don't constrict channel flow capacity are recommended.

4. Open Channels

- a. Diversions of natural washes or changes in the channel's profile should be avoided whenever possible.
- b. Do not permit encroachment into a drainage easement, channel, or its floodway.
- c. If channel lining or landscaping material is used it must be inlaid or located below the design invert (bottom) or the channel. Do not place it on top of the designed finished grade of the channel cross

section. The channel surface material (roughness coefficient) or cross sectional area shall be changed without a plan revision and reapproval by City Staff.

This is a serious wide-spread construction and design oversight. Lining and landscaping material is commonly and incorrectly shown on plans and actually placed on top of the design channel bottom. This reduces and can eliminate a channel's conveyance capacity. This practice also makes it difficult for flow to enter such a channel, often causing ponding and backwater problems on streets and adjacent properties.

- d. If only the channel banks are being lined, the lining material must extend down below the channel invert to below the anticipated scour depth.
- e. Avoid designing turns in open channel conveyance systems sharper than 45 degrees, whenever possible. If curves or bends can't be avoided the run-up on the outside of curves must be calculated and incorporated into the channel design.
- f. Lot lines should not extend out where they overlay or cross a drainage easement or wash. The wash area or drainage channel should be dedicated in a separate drainage easement Tract whenever possible. This will avoid "backyard to backyard" drainage channels, which can result in serious flooding problems.
- g. Block walls or fences commonly separate lots. Channels that go under or through these walls commonly catch debris, clog, and block or divert flow. Homeowners will sometimes unknowingly and other times on purpose block off or plug these openings. There is no way for the City or a Homeowner's Association to inspect, or maintain these openings. In addition, the size of many of these openings is never actually designed or analyzed. Backyards, pools, houses, and lots can be flooded; and walls knocked over and/or undermined when these openings do not function properly.

These situations should be avoided where ever possible.

- h. Lot lines should end at the edge of the wash floodplain, or man-made channel, not in the middle or on the other side. Building envelopes are not recommended for delineating drainage easements. They can help but are too often misunderstood or ignored as a limit to construction of walls or structures.

5. Drainage Easements

- a. Acquire all required drainage easements as early in the planning and development process as possible. Do not allow discontinuous drainage easements. Fill in missing Drainage Easement segments in in-fill areas as development takes place.

6. Stormwater Detention or Retention

- a. Offsite runoff should not be routed into or through onsite subdivision stormwater storage basins.
- b. Basins located on-stream interrupt the natural flow regime of the wash and can: create a continual debris and sediment maintenance problem for the property owner; affect the ability of the basin to drain within the required 36 hours; and if storage is above ground a flood hazard is created for downstream residents.
- c. Storage basins should be designed if at all possible with a gravity drain system and not rely on pumps.
- d. Above ground storage basins contained by fill, levee or berm, should be avoid whenever possible.

- e. On-lot retention on single family residential lots is not permitted.

These are traditionally filled in by homeowners within several years in the process of landscaping. Runoff then ends up in their house, pool, on their neighbor's property, or in a City alley or street.

3.1.5 Stormwater Storage Facilities

A. Stormwater Storage Policy

"As a minimum, all development will make provisions to store runoff from rainfall events up to and including the one-hundred-year six hour duration event."

1. The storage requirement applies to the "development". The development refers to the area within the entire development site. The volume of storage provided onsite must equal the total runoff volume generated from all the areas within the entire site for fully developed conditions. Pre-development versus post development comparisons are not applicable in computing required storage volumes.
2. This policy statement and clarification does not change any requirements or criteria contained in the City Ordinance.

B. Drainage of Stormwater Storage Facilities

See section 3.3 of this manual.

3.1.6 Requirements for Certifications and Required Permits

A. Wall Permits

It is COG policy that requests for wall permits crossing a wash or drainage easement shall be approved by the Public Works Director, or his designee. Walls will be evaluated in relationship to the location of natural washes and the proposed drainage plan for the site as well as for compatibility with adjacent natural and manmade drainage facilities.

B. Stormwater Storage Volume Certification:

The property owner will provide the City with certified as-built dimensions of the basins and the actual volume of storage provided. This must be based on "as built" topographic surveys made by either a civil engineer or land surveyor who is registered to practice in the state of Arizona. These as-built volumes must reflect permanent finished landscaping in place. The volumes shall be certified by the Designed Engineer that the volume

provided meets or exceeds the required design volumes per COG Ordinance and the approved Drainage Report. The volume of storage provided must equal or exceed the approved design volumes before the City will issue Letters of Acceptance.

3.1.7 Obstruction of Waterways Prohibited

A. Obstructions in Drainage Easements

It is the policy of the COG that drainage easements be maintained in an open condition, free from obstructions, in order to pass the flows up to and including the 100-year event. Walls, fences, pools, landscaping, and other permanent structures should not be located in drainage easements. Even if indemnified agreements are obtained, once these types of improvements are installed, it is extremely difficult to remove such improvements. They become an obstruction to flow which can result in damage to others, as well as being damaged themselves .

3.1.8 Stormwater Storage Requirements Waiver Policy

- A. Under the current City of Goodyear policy, stormwater storage is required for 100% of the 100 year storm, requirements may be waived if a project meets one or more of the specified criteria listed below. If the project meets the waiver criteria the City has the option, if it is in the best interest of the public, to grant the waiver. Meeting the waiver criteria, however, does not mean a waiver is automatically granted. Granting or denial of the waiver will only be given after formal review and processing by City staff.
- B. If a waiver is granted, Ordinance No. 94-497 requires controls to reduce pollutants for the 100 year storm or any amount leaving the property.
- C. It is not appropriate to automatically assume stormwater retention is not required because a project area is small relative to the entire watershed.
- D. To obtain a waiver, the developer or their engineer must submit a Request for Retention Waiver Review form and six (6) Preliminary Drainage Reports to the City. After City review, upon approval or denial, the applicant will receive a copy of the completed request form and the Retention Waiver Review form. A waiver approval (the completed Retention Waiver Review Form) must be obtained prior to the processing of any proposed development plans.
- E. If a waiver is granted:

1. All onsite storage requirements are not automatically eliminated. If the project can drain directly into an existing regional drainage system designed and constructed to contain or convey the additional runoff, storage requirements may be waived. If not, the development must store the runoff volume necessary to maintain the integrity of the drainage system.
2. Authorization is not granted by the City for the developer to increase runoff or change drainage characteristics to the detriment of any other property owner.
3. The developer is not relieved of liability if the development causes increased drainage problems or flooding on any other property.

3.2 HYDROLOGY AND DRAINAGE REPORT PREPARATION

3.2.1 Introduction

A. General Comments

1. This manual section describes the City's policies concerning hydrologic analysis procedures to be used in the City of Goodyear for the planning and design of drainage and flood control facilities and the preparation of accompanying drainage reports. This manual contains recommended procedures, equations, data and basic assumptions which the planner or designer is generally required to use. If a situation is encountered in which the use of other methods or data in addition to or instead of these are believed to be more appropriate, then City Drainage Planning staff should be consulted and advance approval must be received before using them. When methods or data not described in this booklet are used, the drainage report must include enough information to enable the City Staff to fully evaluate the applicability of the methods and data.

- a. **Basis of Design**
The Drainage Design Manual for Maricopa County; Volume I, Hydrology, shall be used to determine peak discharges and volumes for design purposes. For flood control projects that are cost-shared with the Flood Control District of Maricopa County, the hydrologic design procedure contained in Vol I, Hydrology of the Drainage Design Manual for Maricopa County must be used.

Peak flow rates shall be determined by the following two methods, as applicable: the Rational Method and rainfall-runoff modeling using the U.S. Army Corps of Engineers' HEC-1 Flood Hydrograph Package.

- (1) The Rational Method is acceptable for small, uniform, regularly shaped watersheds less than 160 acres.
- (2) The Corps of Engineers' HEC-1 computer modeling is required for small watersheds that are non-uniform, irregular in shape, when

routing of flows are necessary, or for areas larger than 160 acres.

2. Study Requirements

A hydrology study shall be performed for each development within the City. The study shall define the overall and sub-drainage areas. It shall also determine appropriate hydrologic data for the following:

- a. Off-Project Areas - The peak flows, times of concentration, and other hydrologic data, for each off-project drainage area tributary to the project shall be computed and submitted in summary form.
- b. Project - Sub-Basins - The project shall be divided into sub-basins tributary to appropriate design points. The pertinent hydrologic data shall be computed for each and submitted in summary form.
- c. "Appropriate Design Points" are those points wherein the peak flow rates, or other pertinent data, is needed to determine flow capacity requirements, inflow-outflow relationships, etc. These "points" would include, but not necessarily be limited to, the following: inflow-outflow points of retention/detention basins, up and/or downstreams ends of culverts; intake points for storm drains (i.e. inlets, catch basins, scuppers, etc.); points immediately upstream and downstream of channel junctions and/or street intersections; others as may be necessary to give a complete hydrologic picture and allow a thorough hydraulic evaluation and/or design of the drainage system:

B. Goals and Objectives

The following are the basic goals and objectives used as guide in preparing this manual:

1. Reflect current requirements of the City ordinance, as well as other applicable County, State or Federal regulations.
2. Use the best and most current data and methods available.

3. Provide guidance for hydrologic design methods that:
 - a. reflect commonly accepted state of the art procedures;
 - b. produce safe, reasonable results (within an acceptable range of values);
 - c. gives flexibility to the designer while at the same time maintains a reasonable level of design consistency in order to facilitate design review;
 - d. are not unnecessarily complex or confusing;
 - e. does not require more detailed or complex input data than is commonly available;
 - f. are technically and legally defensible;
 - g. provides results that are consistent with adjacent jurisdictions, primarily the Flood Control District of Maricopa County (FCDMC) and ADOT.
4. Because of our efforts to meet the above goals and objectives, some options in this manual differ slightly from adjacent jurisdictions, such as the Flood Control District of Maricopa County. However, results do not differ significantly.

C. Application and Limitations

1. The purpose of this manual is to provide a means of assisting in the prediction of runoff which might result from a design storm of a given return interval.
2. Hydrology is a discipline which requires not only technical competence but also experience and good judgment. The City does not warrant or guarantee the reliability of the hydrologic methods, techniques, and/or parameter values described herein. The user of this, manual is thus expected to validate the reasonableness of the predicted values by: applying alternative methods or other appropriate checks which have been developed for this area. Failure to do so may result in erroneous values.

3. It is not the intent nor purpose of this manual to inhibit sound innovative design or the use of new techniques. Therefore as mentioned previously, where special conditions or needs exist, other methods and procedures may be used with prior approval.
4. It is anticipated that, over time, as more data becomes available and/or more appropriate techniques are developed, this manual will be revised. Such revisions will probably take place annually or as needed. If any inadequacies or inaccuracies are found with any of these procedures, they should be brought to the City's attention immediately.

3.2.2 Drainage Report Preparation

A. Requirements for a Drainage Report

1. A drainage report is required by the City to document the effect that a proposed project would have upon stormwater runoff in the vicinity of the project; to provide data supporting the design of facilities to be constructed for the management of stormwater runoff. Each drainage report must consider runoff from storms with a return frequency up to and including a 100-year storm. The complexity of the report depends upon the nature of the project and the site on which the project will occur.
2. A drainage report shall be submitted by a professional Civil Engineer registered in the State of Arizona requesting one of the following:
 - a. Approval of a subdivision plat (preliminary and final)
 - b. A permit for grading
 - c. A permit to construct right-of-way improvements
 - d. A permit to construct any structure

B. The purpose of a Drainage Report

The purpose a drainage report is to document that stormwater runoff has been considered in the planning of each project and the public and its property will be protected from damage by runoff flows and flooding. The requirement for this protection not only applies to those who will own and/or use a proposed project but

also to those who own or occupy property adjacent to or near the proposed project.

3.2.3 Six Elements of a Drainage Report

A. There are six elements of a drainage report which normally must be present to demonstrate that the effects of storm water runoff have been considered and that the runoff will be properly managed by the project. Subparagraphs 1,2,3 and 6, below, are elements found in “Preliminary Drainage Reports” or “Master Drainage Reports;” and subparagraphs 4 and 5, below, should be added to Final Drainage Reports to support design choices shown on construction plans. There will, of course, be cases when one or more of these elements would not be applicable, and there could be special projects requiring analysis or information not covered in these six elements. The six elements are described in the following subparagraphs. In addition refer to the Drainage Report Outline Checklist for specific items that might be included within a drainage report and Master Drainage Plan Requirements.

1. Description of the Property and the Watersheds:
Each drainage report must have a section which includes a narrative, and topographic maps that describes the location and condition of the property the project is located on (on-site conditions) and the upstream (off-site) watersheds as well as any downstream constraints which affect the property.
 - a. On-site Conditions: An essential part of each report is a topographic map which shows the location of the project area.
 - (1) Description of existing drainage patterns including natural and man-made channels and watershed boundaries on the property.
 - (2) Mapping of the 100 year floodplain for washes with a capacity of 100 cfs or greater.
 - (3) Description of the existing ground cover conditions and the identification of the SCS hydrologic soil group(s) found on the property.
 - (4) Description of how existing development located on the property affects drainage.

- (5) Description of how existing and/or proposed developments on adjacent properties affect drainage on the project area.
- b. Off-site Watershed Conditions: Watersheds above the project area from which stormwater runoff enters or affects the project's property must be delineated on topographic maps. These maps should be prepared at a scale which will clearly show the drainage areas so that the watershed boundaries can be drawn with accuracy. Contour lines should be shown on the maps at an interval appropriate to the ground slope and complexity of the terrain.
- c. The narrative description should include the following things:
 - (1) Existing upstream and downstream drainage patterns on the watersheds.
 - (2) The natural ground cover and the SCS hydrologic soil group(s) found on the watersheds.
 - (3) Existing development on the watersheds and how this affects drainage.
 - (4) The location and type of development that would exist on the watersheds
 - (5) Any condition which would significantly affect the way the runoff from the watershed would be analyzed.
2. Estimation of Stormwater Runoff:

The report must provide estimates for selected storm return frequencies of peak stormwater runoff rates at concentration points entering and leaving the property , onsite, from off-site watershed areas. In addition, the report must include estimates of stormwater runoff volumes from the project area or development site that are required to be stored on-site in accordance with City Ordinance requirement.

3. Evaluation of the Effects of The Project:
 - a. The report must show how stormwater runoff will be handled when the project has been completed and how the project will affect stormwater runoff.
 - b. Depicting Pre- and Post-Project Topography: Prior to the project of development of a piece of property, topographic conditions existing on the property which will influence and direct the flow of drainage water which enters the property from watersheds above it or which originates on the property. When the project has been completed, certain topographic changes will have occurred which influence the drainage flows and resulting time of concentration. It is necessary that the drainage report include sufficient pre- and post-project topographic information to demonstrate the effects of the project. This information should be depicted on contour maps. In addition to showing the developer's property, these maps should also show enough of the adjacent property to give a clear picture of what exists, what will affect drainage, and what will be affected by drainage on the property being developed. Information about adjacent property, such as significant differences in elevation, walls, drainage structures, buildings with their floor elevations, etc. must be included.
 - c. Pre- and Post-Project Stormwater Runoff of Offsite Flows: The amount and type of stormwater runoff that would exit the property prior to the project and after the project must be depicted for a 5-year, a 10-year, a 50-year and a 100-year storm. If, as a result of the project, drainage flows will be reduced by facilities such as retention or detention basins, the effect of these facilities on flows exiting the property should be described and depicted on appropriate maps.
4. Presentation of the Basis for Design of Facilities to Manage Runoff:

This presentation includes a summary of the design criteria used, a brief description of the design approach and methods used. The sketches, data, and calculations which support the selection of materials, the locations, and design

of facilities should be included. (See Section 3.1 for design criteria and policy guidance and Section 3.3, Hydraulics, for design guidance of the specific drainage facility.)

5. Presentation of the Basis for Selecting Elevations for the Lowest Floor:
Elevations must be selected to provide protection from flooding. The basis for the selection of a floor elevation or the design of protection for the interior of the building must be presented. (See Manual Sections 3.1 and 3.3)

6. Description of the Provisions for Project Phasing:

- a. Any project, particularly a large one, may have stormwater runoff, flooding, and erosion problems during the construction phases which would not exist after the project has been completed. The report must indicate how the phasing will occur, what interim drainage problems are anticipated, and what must be done to alleviate these problems..
- b. As of October 1, 1992, the National Pollutant Discharge Elimination System (NPDES) General Permit for stormwater discharges requires all owners/operators of construction projects disturbing five or more acres to prepare a Storm Water Pollution Prevention Plan (SWAPPP) and file a Notice of Intent (NOI). The NOI must be sent to the United States Environmental Protection Agency.

The city must have evidence of this permit. A copy of the NOI must be present on the job site at all times.

The goal of this NPDES storm water permit for construction activities is to reduce erosion potential, minimize sedimentation, and to eliminate non-stormwater discharges for construction sites.

3.3 HYDRAULICS

3.3.1 Introduction

- A. The design of drainage and flood control facilities in the City of Goodyear shall follow the current Drainage Design Manual of the Flood Control District of Maricopa County (FCDMC), Volume II, Hydraulics, as supplemented by this manual section. This manual contains clarifications or modifications applicable to the design of facilities within the City of Goodyear (C.O.G.).
- B. Hydrology
The determination of flood hydrology for designing stormwater facilities in the City of Goodyear shall be performed according to the procedures set forth in the City Design Standard Manual. Table 3.3-1 outlines the minimum hydrology design criteria for storm water management and drainage facilities within the City of Goodyear.

3.3.2 General Information

- A. All developments within the City shall provide such storm drainage facilities as are necessary to insure that all structures and properties, both within the development and those located up and downstream of the development, shall be protected from the adverse impact of stormwaters due to the proposed development.
- B. All on-site drainage channels and other structures handling stormwater runoff shall be designed and constructed in accordance with these standards, including single family residential lots. Any proposed structural changes which may accelerate, retard, convey, or redirect surface water runoff in any way must be approved by the City Engineer.
 - 1. Any culverts installed for storm water conveyance shall be 18 inches minimum inside diameter, constructed of approved materials.
 - 2. All culverts shall be installed with both upstream and downstream end sections or headwalls of appropriate type from MAG Standard Details.
 - 3. Where driveways cross existing stormwater channels, the finished elevation of the driveway at the point of crossing the channel shall be at or below the lowest top of curb elevation at the intersection of the driveway and the public street. Where the flow line of the channel is less than 2 feet below the lowest

intersected curb elevation a drop inlet type headwall shall be required if a culvert is used.

C. The City's storm drainage system shall be developed within two broad classifications as follows:

1. The "MINOR SYSTEM" (10 year) shall consists of those collection and/or retention/detention facilities necessary to collect, convey, retain and/or detain stormwater runoff from the more frequent rainfalls. (This is generally considered as the "formal" drainage system). The "Minor System" shall be designed to accommodate storms up to and including a "ten year storm".
2. The "MAJOR SYSTEM" (100 year) shall consist of those facilities necessary to convey stormwater runoff from storms up to and including a "one-hundred year storm". The design of the "Major System" is somewhat less formal than that of the "Minor System". It consists primarily of the planning and / or analysis of the overall drainage system to insure: that there is always positive drainage from all areas, volume retention is available and that the "one-hundred year" offsite flows can safely pass through the project.

3.3.3 Drainage Facilities Shall Consist of The Following Components:

A. Collection System

This portion of the system is intended to collect and convey runoff to either retention/detention facilities and/or outfall points. In general this system consists of the following:

1. Surface Drainage Facilities
 - a. Streets
 - b. Open channels
 - (1) natural
 - (2) manmade
 - ◆ grass lined
 - ◆ gunite/concrete (i.e. smooth lined)
 - ◆ rip-rap

2. Sub-surface Drainage Facilities
Sub-surface drainage facilities are required whenever the capacity of the surface system is exceeded. It is comprised of the following:
 - a. Pipes (plastic and cast-in-place not allowed in public system)
 - b. Manholes/junction boxes
 - c. Catch basin and inlets
3. Retention/Detention Facilities
This portion of the system is intended to retain/detain sufficient volumes of runoff to minimize the adverse impact of the new developments on downstream areas.
 - a. All developments must provide retention/detention facilities.
 - b. Single-Family development, when the lots are less than one acre in area, shall provide a common retention tract that is maintained by the Homeowner's Association.

On-lot retention on individual single family residential lots is not permitted as a solution to subdivision retention requirements, unless lot sizes are one (1) acre or greater.

3.3.4 Drainage

A. Street Drainage

1. Streets shall be designed to carry the following minimum flows:
 - a. Arterial to carry ten year flow between the curbs, the fifty year flows between the property lines.
 - b. Collectors and local streets to carry five year flows between the curbs, the fifty year flows between the buildings (front yard and street).
2. Underground storm drains or open channels are required when the street capacity is exceeded.

3. Dip crossings of open channels shall only be accepted when an alternative all weather access is available to every property. When dip crossings are allowed they shall comply with Table 3.3.1.
4. All storm drains and channels shall be constructed in public rights-of-way or dedicated easements.
5. Pavement Encroachment
Typical street sections used in City of Goodyear are in City of Goodyear Supplement to Maricopa Association of Governments Uniform Standard Details for Public Works Construction.
6. Theoretical Capacity
A Manning's "n" value of 0.020 for residential streets and parking lots and 0.016 for non-residential street flow unless special conditions exist which then must be clearly documented in the Drainage Design Report.
7. Longitudinal Street Grades
 - a. The desirable minimum longitudinal street grade is 0.4% to ensure good gutter drainage. Wherever possible, longitudinal street grades greater than or equal to the desirable minimum grade shall be provided. It is recognized that this desirable grade is not always attainable, particularly with projects involving existing streets. Therefore, the absolute minimum longitudinal street grade is 0.15%.
8. Design Criteria for Intersections
 - a. Valley gutters shall be used to transport runoff across local streets when a storm drain system is not required. However, valley gutters are generally not acceptable for collector or arterial streets.
 - b. In unusual cases, valley gutters may be required to cross collector streets in which case a wider eight foot design width should be used. Mid-block valley gutters should be avoided.

9. Design Criteria for Roadside Ditches

- a. Geometry
Geometry shall be designed to allow maximum conveyance of flows and minimal maintenance.

10. Catch Basins

- a. Catch Basins shall be City of Goodyear, Type "M".
- b. SCUPPERS: MAG Standard Detail 206 shall be used as basis of scupper design unless prior approval of another design is obtained from City Public Works Director, or his designee.

B. Drainage Between Lots

- 1. No subsurface routing of drainage ways between lots or buildings shall be permitted in an easement unless the Public Works Department has approved in writing the placement of the drainage way(s) in an easement(s) and the property owner has granted the necessary easement(s) and right(s)-of-way.
- 2. If approved, the channel shall be designed to convey the one hundred year flow without flooding adjacent properties.
- 3. If approved, the channel shall be constructed in a dedicated drainage right-of-way leading to a positive outfall point. The minimum width of the right-of-way shall be the top width of the channel plus eight feet for a maintenance roadway. The ends of the right-of-way shall be treated in such a manner as to prevent non-maintenance vehicular access without diminishing the hydraulic capacity of the channel. A minimum of 25% of the up-stream opening shall be assumed to be clogged with debris.
- 4. Underground drainage structures shall not be accepted.

C. Underground Storm Drains

- 1. Underground storm drains shall be provided whenever the capacity of the streets is exceeded.
- 2. Pipes shall be sized using "Manning's Formula". Values of Manning's "n" shall be per appropriate technical literature and shall be referenced.

3. Velocities shall range from 3 fps to 9 fps.
4. The minimum pipe size of the lateral collector shall be 18" ID, and the minimum pipe size of the main is 24" ID. In situations where debris is expected, the City's Public Works and Engineering staff should be consulted for applicable debris criteria.
5. The hydraulic grade line may be above the pipe, provided that it remains at least one foot below the ground elevation at all manholes, catch basins, inlets, etc.
6. When the pipe changes direction more than 30 degrees there shall be a drop, between match points, of at least 0.1 feet. In no case shall the deflection angle be greater than 90 degrees.
7. Separation of Storm Drain from Water and Sewer Lines
 - a. Horizontal separation of storm drains and water or sewer lines shall be a minimum of 6 feet.
 - b. Vertical separation of storm drains and sewers should be 2 feet (sewer below) unless the sewer line is manufactured from ductile iron with mechanical joints or equal.
 - c. Vertical separation of storm drain and water line (water line below) shall be 2 feet clear.
 - d. Separation is measured from the outside of the two pipes.

3.3.5 Drainage Materials

A. Pipes

1. Standard material for storm drain pipes in the public rights-of-way shall be rubber gasket, reinforced concrete pipe (R.G.R.C.P.) per ASTM C76. Generally the minimum rating shall be Class III. When the cover is less than two feet the minimum rating shall be Class IV, or concrete backfill used subject to City approval.

B. Manholes/Junction Boxes

1. Materials - all manholes shall be MAG Standards, Details and Specifications.

2. Locations - manholes and/or junction boxes are required at all of the following:
 - a. Junctions of two or more pipes
 - b. Changes in grade
 - c. Changes in alignment
 - d. Changes in pipe sizes (pipe crowns to match)
3. Spacing - the maximum spacing for manholes shall be:
 - a. 400 feet on lines 18" to 36" diameter
 - b. 660 feet on lines 36" in diameter

C. Open Channels

1. Natural Channels - Whenever possible and appropriate it is the City's preference that existing natural drainage channels be left in a natural state. When this is the case a drainage easement or right-of-way shall be dedicated over the 100 year flood plain of the natural drainage way.
2. Man-made Channels - When man-made channels are required the emphasis would be placed on a "natural" appearance. Grass lining with side slopes 6:1 or flatter are preferred.
3. Maximum Velocities/Erosion Protection - In general the maximum velocity shall not exceed the scouring velocity of the soil (with natural cover). When the scour velocity is exceeded additional erosion protection shall be provided. The protection may consist of one or more of the following:
 - a. Concrete/gunite lining (reinforced with 4 x 4 WWF - 12GA).
 - b. Natural stone grouted rip-rap 4" to 12" diameter stones - leave a minimum 1/4 diameter exposed. Maximum 1/2 diameter exposed.
 - c. Check dams, at 3 foot elevation intervals.

4. Maintenance

- a. Access: Open channels to be properly maintained should provide reasonable access for maintenance. Minimum width of access should be 8 feet. Spacing between vehicular access points should be a maximum of 1/2 mile. A minimum of one access point per subdivision is required. Non-vehicular access points shall be provided every 660 foot maximum. If the facility is to be City maintained the above minimum requirements are mandatory.
- b. Responsible Party: Maintenance of drainage facilities within the City of Goodyear is usually the responsibility of the property owner or the Subdivision's Homeowners Association. Specific maintenance responsibilities should be called out on the Recorded Plat and the Grading and Drainage Plan.

3.3.6 Culverts and Bridges

A. Inverted Siphons

- a. General
Inverted siphons shall be used only when no other solution is available to the designer. Prior City Engineer approval is required.

3.3.7 Detention or Retention Facilities

A. Sizing

1. Basis of Design

- a. All retention/detention facilities shall be sized to retain 100% of the one hundred year - six hour storm falling over the entire project (gross area including streets). For purpose of determining the volume required, the project shall be considered to extend to the centerline of all existing and/or future streets on the exterior boundaries and to include all interior streets and other rights-of-way within the project.

b. Freeboard

- (1) There shall be a minimum of one foot freeboard from the water surface elevation to the lowest building elevation and/or the gutter of the upstream streets.
- (2) There shall be a minimum six (6) inches freeboard from the water surface outfall to the lowest top of bank.

2. Volume - The following data, as applicable, shall be provided for each retention/detention basin.

a. Two methods are defined for the determination of peak flow rates: the Rational Method, and rainfall-runoff modeling using the U.S. Army Corps of Engineers' HEC-1 Flood Hydrograph Package.

- (1) The Rational Method is acceptable for small, uniform, regularly shaped watersheds less than 160 acres.

$$V = C\left(\frac{P}{12}\right)A$$

where

V = total runoff in cubic feet.

C = a coefficient relating the runoff to rainfall

P = 3 inches (100 yr. 6 hr. depth)

A = drainage area (square feet).

Drainage Design Manual, Volume I, Section 3
Rational Equation.

- (2) The Corps of Engineers' HEC-1 computer modeling is required for small watersheds that are non-uniform, irregular in shape, when routing of flows are necessary, or for areas larger than 160 acres.

3. Retention/Detention Basins shall be located such that they can intercept the flows from the entire site.

If the basin is located other than at the lowest point of the project, the Design Engineers shall denote on the master

drainage map the actual or effective drainage area. If portions of the project cannot drain to the primary basin, additional basins shall be added to retain runoff from these areas. Credit will not be given for providing volume in excess of that needed to retain the one hundred year - six hour storm from a basin's effective drainage area.

- B. Volume Certification: The property owner will provide the City with certified as-built dimensions of the basins and the actual volume of storage provided. This must be based on "As-Built" topographic surveys made by either a civil engineer or land surveyor who is registered to practice in the State of Arizona. These as-built volumes must reflect permanent finished landscaping in place. The volumes shall be certified by the Design Engineer that the volumes provided meets or exceeds the required design volumes per COG Ordinance and the approved Drainage Plan. The volume of storage provided must equal or exceed the approved design volumes before the City will issue Letters of Acceptance for maintenance of any public facilities.

C. Grading

1. Depths

- a. The basins shall not exceed 1.5 feet of water depth within 10 feet of the right-of-way unless there is a fence or other similar protection to restrict access to the area.
- b. The overall average depth shall not exceed three (3) feet without authorization of the City. If granted, the basin must be fenced to prohibit access or a side slope of 8:1 shall be provided for a minimum distance of 25 feet measured from the one hundred year high water level.
- c. While it is the City's intent that the "average" depth not exceed three feet, it is also the City's intent that the basins be contoured to present an aesthetically pleasing appearance. Therefore, up to 25% of the bottom area may be up to four (4) feet deep.
- d. In no case shall the depth exceed 1.0 foot without a positive means of disposing of accumulated runoff.

2. Slopes - Side and Bottom

- a. Bottom - The bottom of all basins shall be sloped towards the discharge points. The minimum bottom slope shall be 1/2%.
- b. Side Slopes
 - (1) Side slopes adjacent to public rights-of-way, or when there is pedestrian type access to that portion of the basin, shall have a side slope of 6:1 or flatter.
 - (2) Side slopes adjacent to walls, fences, hedges, etc. (i.e., no or limited pedestrian type access in that area) may have side slopes up to 4:1.
 - (3) Retaining walls (i.e., vertical slopes) may be used in areas adjacent to permanent walls, fences, etc.

3. Grading/Landscaping/Joint Use As Parks

- a. It is the intent of the City that retention/detention basins present an aesthetically pleasing appearance. The Design Engineer shall endeavor to "contour" the sides and bottoms of the basins to enhance appearance through varied slopes.

The developer and designer shall work with representatives of the City's Community Development Department to determine the need/desirability and feasibility of joint usage of the basin as a park site. If appropriate, the design shall provide for appropriate open areas for the recreational facilities.

- b. It is not the intent of these guidelines to dictate the specific details of the configuration to the designers however, the following concepts will be used as the basis of reviewing the plans:
 - (1) Curvilinear sides should be used in lieu of long stretches of straight lines.

- (2) Side slopes should be varied (i.e., start with 6:1 then change to 7-8:1 or more. With appropriate use of landscaping, side slopes can even be reduced to 4:1.
 - (3) Bottom areas should contour to varying depths in lieu of uniform depth/slope.
 - c. The tops and bottoms of side slopes shall be rounded off - generally over a distance five of (5) feet each way of the "PI".
 - d. Landscaping - Section 7.5 defines the basic landscaping requirements for retention/detention basins. As with the grading the landscape plans shall be reviewed in regard to aesthetic effect of the proposed design.
- 4. Retention/Detention in Parking Lots.
 - a. Retention/detention in parking lots of multi-family developments is not allowed. All retention/detention of such developments shall be in landscaped areas.
 - b. Retention/detention of runoff in parking lots of industrial/commercial developments is allowed subject to the following guidelines:
 - (1) No more than 50% of the required storage volume may be retained/detained in parking areas. The balance shall be provided in landscaped areas. The tributary areas to each "basin" shall be noted on the master drainage map.
 - (2) No more than 50% of the required parking spaces shall be covered by stormwater retention/detention.
 - (3) Storage system shall be designed to store the first 30% of the required runoff volume off paved areas (to avoid nuisance water constantly ponding on the pavement).

- (4) Depth of water shall not exceed six inches within the parking area, nor shall it exceed 0.15 feet at the midpoint of any parking space.
 - (5) Interference with pedestrian traffic will be minimized in the design of the storage facility.
 - (6) A continuous fire access lane shall be provided throughout the development, and it shall be free of ponded water from the retention areas.
 - (7) All parking spaces shall be accessible during periods when the basins are filled to capacity, without pedestrians having to cross ponded water deeper than 0.15 feet.
- c. Before final plan approval an approved Drainage Report must show the calculated stormwater storage volume based on runoff from the 100 year 6-hour storm.

5. Overflow/Outfall

- a. Outfall - Each project shall be designed such that the "ultimate" outfall for all drainage in excess of the one hundred year - six hour storm is routed to a public street, storm drain, drainage channel or natural watercourse. The outfall shall be accessible without draining over private property.
- b. If such an outfall does not exist the project must provide an outfall.

6. Overflow/Conveyance

- a. Off-project flows which historically flowed through the project may be routed through the project.

Offsite runoff volumes shall not be allowed across private lots, streets, or public/private access ways.
- b. Runoff volumes in excess of those required to be retained/detained (currently the one hundred year - six hour storm) may be routed directly through the outfall, although they must be routed via the retention/detention facilities.

7. Location/Conflicts With Existing Utilities
 - a. Retention/detention facilities shall not encroach into existing easements for private utilities without written approval of the encroachment from all utilities using the easement.
 - b. Retention/detention facilities shall not encroach into public rights-of-way nor into public easements. If necessary the developer shall relocate conflicting utilities into a new dedicated easement.
 - c. The top of the retention/detention facilities (i.e., freeboard elevation) shall be at least four (4) horizontal feet from any building or public roadway.
 - d. Retention/detention facilities shall not be located within 20 feet of an active septic system nor within 100 feet of an active water well.
 - e. A minimum three feet of cover (from the bottom of the basin to the top of the pipe) shall be maintained over water and sewer service lines.
8. Disposal/Discharge
 - a. All retention/detention facilities shall have a positive method of disposing of retained/detained runoff waters. All water so retained/detained shall be disposed of within 36 hours. Public streets are not considered an acceptable outlet for disposal of retained/detained runoff, however, are considered an acceptable outlet for overflow. Only under special circumstances with prior city staff approval should pump disposal methods be used.
 - b. The minimum allowable pipe size for primary outlet structures is 18 inches.

- c. Acceptable methods of disposal of accumulated storm water runoff are:
- (1) Positive gravity outlet
- ◆ Surface percolation, evaporation, and transpiration. Drywells are not an acceptable method of disposal of accumulated storm water.
 - ◆ Discharge to an existing storm drain with a maximum discharge of one cubic foot per second. (Waiver Required)
 - ◆ Discharge to a drainage channel either natural or man-made of sufficient capacity to convey the anticipated flows from the tributary drainage area. (Waiver Required)
 - ◆ Water cannot be discharged into a city: street, gutter, or alley.
- (2) Pump Station (Waiver Required)
- ◆ to an open channel either natural or man-made
 - ◆ or subsurface directly to a nearby storm sewer system with a maximum discharge of one cubic foot per second.
 - ◆ or surface to a storm sewer system if pumped water can be discharged directly into a catch basin or other inlet.
 - ◆ Water cannot be discharged into a city: street, gutter, or alley.
- d. Basin Floors
- (1) The basin floor to infiltrate properly must be an “Engineered Basin Floor”. They are

generally landscaped and maintained for looks only.

- (2) DRAIN TIME: All storage facilities should be designed such that the stored runoff shall be discharged completely from the facility within 36 hours following the storm event. This is a City Ordinance requirement related to County Health Department Standards.

Percolation tests and results shall accompany all Drainage Reports.

9. Stormwater Storage Requirements Waiver Policy
See Section 3.1.8.
10. Nuisance Water - each basin, particularly those used as a park, shall be graded such that there is one-or-more "sump" areas wherein runoff from the more "frequent" storms and nuisance runoff may be retained/detained without flooding the balance of the basin, with preference to surface percolation.

D. Embankment Design Criteria

1. Detention or Retention facilities should be constructed below the natural ground surface.
2. The use of embankments to impound stormwater runoff requires prior approval by City Public Works Director, or his designee. Embankments become small dams that can be a serious potential downstream flood hazard.
3. If approval is obtained, all the design requirements contained in the FCDMC Manual Sec. 8.3.3 must be completely and thoroughly followed.
4. The owner/developer must provide the City as-built certification by a registered Geotechnical or Civil Engineer, experienced in dam technology, that the embankment was designed, and constructed properly, is stable, and will safely impound the design volumes of water.

E. Operation and Maintenance

Maintenance of Detention or Retention facilities within the City of Goodyear is usually the responsibility of the property owner or the Subdivision's Homeowners Association.

3.3.8 Summary of Drainage Design Guidelines

The following guidelines are based on recurring drainage and flooding problems observed in Goodyear related to specific design or construction practices:

A. Subdivisions

1. A subdivision should always have an approved subdivision-wide drainage plan. Drainage based on individual lots submitting separate grading plans as each lot is developed should be avoided.
2. Avoid design of a common drainage facility that requires maintenance by individual property owners. Put the drainage facility in a common Tract with the Homeowner's Association responsible for maintenance.
3. People have no awareness and/or incentive to perform the necessary maintenance unless they are directly and adversely affected.

B. Storm Drains

1. Avoid if at all possible the interception of an offsite natural wash with the intent of collecting it and putting it into a pipe or an underground storm sewer system.
2. Washes and even man-made channels carry a never ending supply of sediment and debris. It is almost impossible to collect and filter out this debris without a constant clogging and maintenance problem. If there is no alternative to the routing of an open channel into a piped system, water should be first routed into a sediment or debris basin. Periodic maintenance of the debris basin should be planned by the Homeowner's Association.

C. Culverts

1. Culverts should not be placed more than 0.5 feet below the natural wash invert, or the capacity must be reduced by the cross section area below this depth.
2. Culverts or homemade bridges for private driveways or walkways over washes or drainage channels whose source originates off-site or off-lot should generally be designed by a professional civil engineer/drainage designer.

3. For small private driveways or walkways, dip crossings or free span bridges that won't constrict the flow capacity of the channel, are recommended. Small drainage structures not designed with any hydrologic and hydraulic analysis may be OK for crossing channels originating onsite (on-lot). Homemade drainage structures can be disastrous for the homeowner, his neighbors, and adjacent streets if installed on larger washes originating offsite (off-lot) without the help of a professional, and shall be designed by a professional Civil Engineer.

D. Open Channels

1. Diversions of natural washes or changes in the channel's profile should be avoided whenever possible.
2. Do not permit encroachment into a drainage easement, channel, or its floodway.
3. If channel lining or landscaping material is used it must be inlaid or located below the design invert (bottom) of the channel. Do not place it on top of the designed finished grade of the channel cross section. The channel surface material (roughness coefficient) or cross sectional area shall not be changed without a plan revision and reapproval by the City.

This is a serious wide-spread construction and design oversight. Lining and landscaping material is commonly and incorrectly shown on plans and actually placed on top of the design channel bottom. This reduces and can eliminate a channel's conveyance capacity. This practice also makes it difficult for flow to enter such a channel, often causing ponding and backwater problems on streets and adjacent properties.

4. If only the channel banks are being lined, the lining material must extend down below the channel invert to below the anticipated scour depth.
5. Avoid designing turns in open channel conveyance systems sharper than 45 degrees, whenever possible. If curves or bends can't be avoided the run-up on the outside of curves must be calculated and incorporated into the channel design.

6. Lot lines should not extend out where the overlay or cross a drainage easement or wash. The wash area or drainage channel should be dedicated in a separate drainage easement Tract whenever possible. This will avoid “backyard” drainage channels, which can result in serious flooding problems.
 - a. Block walls or fences commonly separate lots. Channels that go under or through these walls commonly catch debris, clog, and block or divert flow. Homeowners will sometimes unknowingly and other times on purpose block off or plug these openings. There is no way for the City or a Homeowner’s Association to inspect, or maintain these openings. In addition, the size of many of these openings is never actually designed or analyzed. Backyards, pools, houses, and lots can be flooded; and walls knocked over and/or undetermined when these openings do not function properly.
 - b. Lot lines should end at the edge of the wash floodplain, or man-made channel, not in the middle or on the other side. Building envelopes are not recommended for delineating drainage easements. They can help but are too often misunderstood or ignored as a limit to construction of walls or structures.

7. **Drainage Easement**
Record all required drainage easements as early in the planning and development process as possible. Discontinuous drainage easements for channels are not permitted. Missing drainage easement segments must be dedicated as development takes place.

Table 3.3-1
Hydrology Design Criteria

Drainage Feature	Peak Frequencies			
	5 Year	10 Year	50 Year	100 Year
Street with Curb & Gutter	Runoff (the flow of water) on collector and local streets contained within street	Runoff (the flow of water) on arterial streets contained within street curbs. For major collector and all arterial streets one 12-foot dry lane must be maintained in each direction.	Runoff on arterial streets contained between the property lines. Runoff on collector and local streets contained between the buildings (front yard and street).	Runoff to be confined to road right of way or to drainage easements. Maximum depth for water (d_{max}) $d_{max} = 8$ inches above (low spot) the street. Major collector/arterial runoff below the finished floor of adjacent buildings.
Street with Storm Drain System	N/A	Pipes or roadway channels are added if the 10-year runoff exceeds street capacity as addressed above.	N/A	Storm drain systems are used if 100-year runoff inundates the building's first floor. Storm drain systems: catch basins, cruppers, etc. to be provided to remove water so as not to exceed $d_{max} = 8$.
Cross Road Culvert or Bridges for Local and Minor Collector Streets	N/A	N/A	Runoff to be conveyed by culvert or bridge under road with no flow overtopping the road.	Runoff to be conveyed by culvert and by flow over the road with maximum 6-inch flow depth over the road. Minimum Freeboard for Bridges 2.0 ft.
Cross Road Culvert or Bridges for Local and Minor Collector Streets	N/A	Runoff to be conveyed by culvert or bridge under road with no flow overtopping the road.	For a 25 year frequency storm runoff to be conveyed by culvert or bridge and by flow over the road with maximum 6 - inch flow depth over the road.	Maximum depth flow over road 12 inches.
Any street crossing a water course that provides the only access to residential areas	N/A	N/A	N/A	All lots and structures must be accessible by at least one route with the depth of flow no greater than one foot over the road during the 100 year run off event.
FEMA Floodplain Channel	N/A	N/A	N/A	100-year peak discharge.
Channel to Convey Offsite Flow Through Development	N/A	N/A	N/A	100-year peak discharge
Stormwater Storage	N/A	N/A	N/A	100-year 6 hour runoff for determining on-site storage volume.

4.1 STREET GEOMETRICS

4.1.1 General Comments

This section describes the geometric requirements for each street classification: parkway/expressway, major arterial, minor arterial, major collector, minor collector, local collector, local residential, local commercial and local industrial. The requirements described herein are primarily based on safety considerations; therefore, standards that provide a greater degree of safety may be used within reasonable economic limits, but standards that provide a lesser degree of safety may not be used without approval from the City Engineer.

While every effort has been made to ensure the accuracy and completeness of these guidelines, the City of Goodyear shall not be held responsible for any errors or omissions. It shall be the sole responsibility of the design engineer to ensure a proper design and the accuracy and completeness of construction documents containing his or her signature.

A. Use of National Standards

1. Geometric Design Standards

The American Association of State Highway and Transportation Officials (AASHTO) policies on highway design are approved references and are to be used together with this manual.

2. Traffic Control Standards

All traffic control devices shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) prepared by the U.S. Department of Transportation, City of Goodyear Design Standards and Policies, Section 3.4: Bikeways, and Section 3.6: Traffic Signs and Markings.

B. Street Types:

The City of Goodyear has four basic types of streets: These are Freeway/Expressway, Arterial, Collector, and Local.

1. Freeways

Freeways will be designed to safely handle very large volumes of through traffic. Direct access will be limited to widely spaced interchanges. Design, construction and operations shall be provided by the Arizona Department of Transportation.

Expressways

Expressways provide for efficient movement of large volumes of through traffic. Direct access is limited to designated intersections.

2. Arterial Streets

Arterial streets with raised medians provide regional continuity and carry large volumes of traffic between areas of the City and through the City. Full access to abutting commercial and multi-family land uses is limited to median openings. Single-family residential developments may not have direct access to an arterial street.

3. Collector Streets

Collector Streets provide direct access to abutting land uses, handle local traffic, and provide access to the collector street system. Local streets normally will not be connected to arterial streets.

4. Local Streets

Local streets provide direct access to abutting land uses, handle local traffic, and provide access to the collector street system. Local streets normally will not be connected to arterial streets.

Deciding the location of local collector, residential, commercial and industrial streets is usually part of the development site planning process. Frequently, planning for local streets is influenced by the plans for adjacent developments which have recently been approved. The Development Policy Committee will review each preliminary proposal for development and will specify any changes needed to conform with previously planned and approved street alignments. The Development Policy Committee will also specify the classification for each street involved in the plan.

5. Following is a listing of each street classification followed by the number of the detail that depicts the standard street cross-section for that classification.

STREET CLASSIFICATION

City Center Arterial	G-3120
Scenic Arterial	G-3120
Arterial with Bike Path	G-3122
Major Arterial with Bike Path	G-3122
Major Collector with Bike Path	G-3124-1
Minor Collector with Bike Path	G-3124-1
Minor Collector with Bike Lane	G-3124-2
Major Collector Special Use with Bike Path	G-3124-3
Local Residential	G-3126

Street classifications are determined by location and/or intended use.

6. All developments shall provide for public arterial and collector streets at their normal alignments.

C. Street Names

Street names shall be consistent with the natural alignment and extension of existing streets and the "M.A.G. Address and Street Assignment Policy". New street names shall not duplicate in whole or in part, or be confusing with existing street names. The City Council reserves the right to modify street names to conform to City standards.

D. Intersections to Arterial Streets

Interior streets shall not intersect arterial streets other than at the 1/4 and 1/2 mile points of the arterial.

4.1.2 General Technical Information

A. Street Name Signs

1. All new developments shall provide for street name signs and posts at all intersections. The developer shall install these signs and posts at public street intersections upon payment of all applicable fees. Construction bonds will not be released until these fees have been paid.
2. Private streets shall be signed by the developer per Detail G-G-3140.

B. Survey Monuments

1. All developments shall provide survey monuments at section corners, street centerline intersections, street centerline alignment changes (P.C.'s or P.I. if it is within street pavement), and subdivision corners. For new building construction the City Engineer may not require, with prior written approval, replacement of monuments for areas outside the right-of-way.
2. All section corners, 1/4 corners, and center of section shall be a brass cap in a hand hole per MAG Std. Det. 120-1-A. All other required survey monuments shall be a brass cap on the surface per MAG Std. Det. 120-1-B. All existing monumentation shall be preserved both horizontally and vertically.

C. Irrigation Facilities

1. All new developments shall provide for continued and undiminished service of affected irrigation systems.
2. The developer is responsible for coordinating with Roosevelt Irrigation District/Buckeye Irrigation District for the design and construction of R.I.D./B.I.D. facilities.
3. Private irrigation facilities shall be located on private property and sized to carry at least the same flow as the existing ditch, or as may otherwise be directed by the City. The Engineer shall submit appropriate data to support the design.
4. Where there is need to cross public right-of-way, it shall be done at approximately 90 degrees and they must be tiled with R.G.R.C.P. in accordance with the criteria outlined in A.S.T.M. Specifications Section C 361.

D. Barricades

1. All new developments shall provide for barricades at all deadends and incomplete streets per M.A.G. Std. Dtl. 130-B.
2. New barricades shall be constructed per MAG Std. Det. 130-B modified with red and white reflectorized stripes using engineer grade reflective sheeting.
3. Barricades installed with phased construction may be relocated within the same development.

4.1.3 Design Standards

A. Street right-of-way Requirements

The right-of-way requirements shown in Details G-3120 through G-3126 are based on the space needed for the street when it is constructed to meet ultimate development requirements. The right-of-way must also provide space for utilities, cut or fill slopes, sidewalks, bicycle paths, trails, traffic control devices and information signs, fire hydrants, landscaping, transit facilities and other public facilities that must be located adjacent to street pavements.

Right-of-way widths in excess of the standard widths may be required in special circumstances such as when:

1. Cut or fill slopes cannot be confined within the standard width;
2. Minimum sight distance lines on horizontal curves are not within standards;
3. Minimum sight distances at intersections are not within the standards;
4. Auxiliary lanes are to be provided.

B. Pavement Cross-Section Slopes

1. Typical Street Cross-Sections

Undivided streets should have a normal crown that is a two-way cross-slope with the cross-section high point on the street centerline. Divided streets should have cross-slope on each pavement section. The high point of each slope on each pavement section shall occur on the edge of the pavement nearest to the median. Unusual conditions may cause cross-slope requirements to vary, but normally, the desirable cross-slope is 2%, with a maximum cross-slope of 3%. Any deviation from the desirable cross-slope is subject to review by the Engineering Department.

2. Cross-Sections in Street Dip Sections

While dip sections are discouraged, where storm drainage runoff flows must cross the street, dip sections are needed. The pavements through the dip section should have a one-way slope (no crown), curbing and medians must not be raised, and cut-off walls shall be installed in accordance with City of Goodyear standard

details. Transitions back to normal street cross-slopes will be needed at both ends of the dip section.

C. Medians

1. Median Widths

The width of a median is measured from back of median curb to back of median curb. If the median has no curb, the width is measured between the centers of the continuous, painted median stripes. In special circumstances, the Engineering Department may approve widths other than those listed, but in no case shall a median be constructed with a width less than 3 feet.

2. Paved Widths

A median less than 4 feet wide should be paved. The paved surface should be crowned and have the same cross slope as the street pavement. Acceptable paving materials are concrete pavers.

3. Unpaved and Landscaped Medians

Medians that are 4 feet or more in width are normally not paved. The grading of the unpaved areas should be as shown in Details G-3120 through G-3124-1. If a median is to be landscaped, it shall be not less than 5 feet wide.

D. Curbs

1. Vertical Curbs

a. Vertical curbs are required for all streets except local residential streets (see Details G-3120 through G-3124-3). Vertical curbs may be used where roll curbs are specified if drainage considerations make such use desirable.

b. Vertical curbs with gutter are to be constructed in accordance with City of Goodyear standard details. Vertical curb and gutter type shall match the adjacent pavement slope to the gutter cross slope direction. The curb height shown on the standard detail is 6 inches, but the following variations may be used where appropriate:

- (1) Where fire lane or public maintenance vehicle access to abutting property must be provided over the curb, use City of Goodyear mountable curb and gutter.

- (2) If special drainage requirements make a higher curb necessary, the height may be increased to 8 inches maximum and the width of the gutter may be increased to 24 inches.

2. Roll Curb

Roll curbing is required for local residential streets except where vertical curb is required, and is to be constructed in accordance with MAG Standard Details.

3. Cut-Off Walls

In locations where dip sections are permitted to allow drainage flows to cross roadways, cut-off walls conforming to City of Goodyear standard details must be installed. Cut-off walls must be at least 3 feet deep and have a top that is flush with the pavement surface. The exposed portion of the cut-off wall will have the appearance of a ribbon curb, with the same width as the street's regular curb and gutter (see Detail G-3520). The cut-off walls must extend across the flow path in the dip section to protect the pavement structure during runoff flows from a 100-year storm. Transitions will be needed between the regular curbs and the cut-off walls at each end of the dip section.

4. Curb Returns

Vertical curb shall be used through the curb return from PC to PT regardless of whether the tangent curb sections are vertical or roll curb. All curb returns shall be provided with sidewalk from PC to PT of the same width as that provided for the sidewalk behind the tangent curb sections. If no sidewalk is provided adjacent to the return, behind the tangent curb sections, the curb return sidewalk shall be at least 4 feet wide. Sidewalk ramps are not required when sidewalk is not present.

- a. Curb Return Radii

All street intersections shall be constructed with concrete vertical curb returns and a single ramp per MAG Standard Details and the American Disabilities Act (A.D.A.).

- (1) The radii for curb returns measured to the back of the curbs shall be 20 feet for intersections that involve either a local collector street or local residential street.

- (2) The radii for curb returns measured to the back of the curbs shall be 35 feet for intersections that involve an arterial street.
- (3) The radii for curb returns measured to the back of curbs shall be 30 feet for all other street intersections.

E. Selection of a Design Speed

The design of geometric features such as horizontal and vertical curves will depend upon the design speed selected for the street. The choice of the design speed is primarily determined by the street classification. The design speed is the maximum speed for the safe operation of a vehicle that can be maintained over a specific section of a street when conditions are so favorable that the design features of the street govern.

F. Superelevation in Curves

Superelevation is discouraged on horizontal curves in the portion of the City outside the Environmentally Sensitive Lands area.

1. 0.02 ft/ft Superelevation
Superelevation of 0.02 ft/ft may be used when the standard radius cannot be provided due to circumstances beyond the control of the engineer and the general alignment cannot be changed.
2. Superelevation Greater than 0.02 ft/ft
Superelevation greater than 0.02 ft/ft may not be used except when approved by the City Engineer. In no case shall a superelevation exceed 0.06 ft/ft.
3. Transition for Superelevation
 - a. The length of superelevation transition shall be based on the superelevation rate and the width of rotation. The axis of rotation shall generally be about the pavement centerline. For superelevations, refer to the AASHTO publication, A Policy on Geometric Design of Highways and Streets.
 - b. With respect to the beginning or ending of a horizontal curve, one-third (1/3) of the transition should be on the curve and two-thirds (2/3) of the transition should be on the tangent pavement section.
4. Drainage on Superelevation Curves
Whenever superelevation is allowed on a divided street, a storm drainage system to collect the runoff along the median curb shall be

provided. In no case shall nuisance water from the higher traveled way be allowed to cross the lower traveled way.

G. Horizontal Curves

Horizontal alignments should provide for safe and continuous operation of motor vehicles at a uniform design speed for substantial lengths of street. A horizontal curve is required when the angle of change in horizontal alignment is equal to or greater than one degree. The nature of the surrounding development and topography and the street classification will establish the factors that determine the radius of a curve.

1. Minimum Radii of Curvature

The minimum radius of curvature will be determined by the design speed or by the stopping sight distance.

a. Consideration of Stopping Sight Distance

When walls, buildings, bridge piers, cut slopes, vegetation, or other obstructions are near the roadway on the inside of a curve, they can block a driver's view of the road ahead. If they are too close, the driver will not have sufficient distance along the curved roadway to stop when a hazardous condition comes into view.

For design, the driver's eye is 3.5 feet above the center of the inside lane (the driving lane closest to the inside of the curve) and that the hazardous condition is an object 0.5 feet high in the center of the inside lane. The line of sight is assumed to intercept the view obstruction at the mid-point of the line of sight 2.0 feet above the center of the inside lane. The clear distance, "M", is measured from the center of the inside lane to the view obstruction. MUTCD depicts these relationships and a table of minimum stopping sight distances for various design speeds.

2. Reduced Design Speeds on Curves

The reduction of a street design speed on a curve should be avoided. However, where physical restrictions prohibit increasing the radius of the curve or the clear distance, "M", the design speed for the curved section may be reduced. In such circumstances, signing in accordance with MUTCD is required. The difference between the design speed for the roadway approaching the curve and the design speed for the curve shall not be greater than 10 miles per hour. The design speed for a curved roadway section must not

be reduced if the reduction would occur at the end of a long tangent or at any location where high approach speeds may be expected.

3. Compound Curves

Compound curves should be avoided. However, if site conditions make the use of compound curve unavoidable, the shorter radius shall be at least $\frac{2}{3}$ the length of the longer radius when the shorter radius is 1,000 feet or less. Compound curves are not permitted when design speeds require the shorter radius to be greater than 1,000 feet.

4. Tangent Sections Between Curves in the Same Direction

On two-lane roads, tangent sections are needed between two curves in the same direction.

5. Tangent Sections Between Reverse Curves and Approaching Intersections

A tangent section must be provided between two curves that curve in the opposite direction. A tangent section must also be provided between an intersection and a curve. If the curve radii are at least 50% greater than the radii required by the design speed, the tangent sections may not be required, depending on grades, topography and vegetation.

H. Vertical Alignment

A vertical curve is required when grade changes are equal to or greater than 1.5%. All sections of a street's vertical alignment must meet passing and stopping sight distance requirements for the design speed established for the street. For further details, see the AASHTO publication, A Policy on Geometric Design of Highways and Streets.

1. Longitudinal Street Grades

For parkways, expressways, and arterial streets the maximum grade is 6%, for collector and local streets the maximum grade is 9%. The minimum longitudinal street grade for all streets is 0.4%. Wherever possible, longitudinal street grades greater than or equal to the minimum grade shall be provided. Where necessary, grades less than 0.4% may be used. Therefore, the absolute minimum longitudinal street grade is 0.15%.

2. Combined Horizontal and Vertical Curves

When horizontal and vertical curves are combined, the horizontal curve shall lead and follow the vertical curve. For additional

information on this topic, refer to the AASHTO publication, A Policy on Geometric Design of Highways and Streets.

I. Intersections

Although all intersections share certain common elements, they are not subject to generalized treatment.

1. To minimize conflicts and provide for anticipated traffic movements each intersection must be evaluated with regard to its individual characteristics, and designed based on the following factors:
 - a. Traffic factors such as capacities, turning movements, vehicle size and operating characteristics, vehicle speed, pedestrian movements, transit operations, and accident history.
 - b. Physical factors such as topography, existing conditions, channelization requirements.
 - c. Human factors such as driving habits, reaction to surprises, decision and reaction time, and natural paths of movement.
2. Angle of Intersection

A right-angle intersection provides the shortest crossing distance for intersecting traffic streams. It also provides the most favorable condition for drivers to judge the relative position and speed of intersecting vehicles. Where special conditions exist, intersection angles may diverge from a right-angle by a maximum of 2 degrees (4 degrees with approval of the City Engineer) on parkways, expressways, arterial streets, and major collector streets and by a maximum of 4 degrees (15 degrees with approval of the City Engineer) on minor and local collector streets, couplets, and local streets.
3. Alignment and Profile

Intersections occurring on horizontal or crest vertical curves are undesirable. When there is latitude in the selection of intersection locations, vertical or horizontal curvature should be avoided. A line or grade change is frequently warranted when major intersections are involved. If a curve is unavoidable, it should be as flat as site conditions permit. Where the grade of the through roadway is steep, flattening through the intersections is desirable as a safety measure.

4. Intersection Sight Distance

In order to provide the opportunity for vehicles on a stop-controlled intersection leg to safely cross or make left or right turns on to a non-controlled intersection leg, adequate sight distance must be provided. Two sight distance triangles may be drawn to represent the areas that must be free of all objects, vegetation and topography in excess of eighteen inches above the pavement on the stop-controlled intersection leg. Two methods may be used for determining the sight triangles.

MUTCD depicts the technique for determining the sight triangle utilizing the location of the driver's eye. MUTCD shows the sight triangle utilizing the right-of-way lines. Either method may be utilized by the engineer.

5. Valley Gutters at Street Intersections

- a. Concrete valley gutters (MAG Std. Detail 240) shall be constructed at all intersections where the drainage pattern requires them.
- b. Asphalt valley gutters are not allowed on public streets.
- c. Locations of Valley Gutters
Valley gutters may only be used across minor and local collector streets, and local residential streets. Exceptions must be approved by the City Engineer.
- d. Valley Gutter Widths
Valley gutters should be constructed in accordance with City of Goodyear standard details.

6. Turning Lanes

A separate turning lane permits separation of conflicting traffic movements and removes turning vehicles from the intersection area. Right turn lanes shall be provided on major arterial streets at all street intersections, and at driveways where warranted. For left turn lanes at signalized intersections, dual turn lanes should be considered when the turn volume exceeds 200 vehicles per hour, the opposing through volume exceeds 1,000 vehicles per hour, or the delay to left turning vehicles exceeds 45 seconds. Abrupt reduction of alignment and sight distance standards should be avoided. The length of these lanes depends on several factors and must be determined on a case-by-case basis and approved by the City Engineer.

7. Median Design

Raised medians are required on parkways, expressways, arterial streets, and couplets to separate traffic flows, channelize left turns and reduce conflicts. On collector streets, flush or painted medians provide space between the through traffic lanes for left turning vehicles.

a. Raised Medians

Raised medians, where required, must be provided in accordance with the applicable City of Goodyear standard details, with the appropriate median width as noted above.

(1) Spacing and Location of Median Openings

If a street has a raised median, it is not possible to provide an opening in the median for every street intersection or driveway location. Full median openings should occur at not less than 1/4 mile intervals on parkways, expressways, and major arterial streets. Partial median openings, which allow only left turns off the major street, are acceptable at 1/8 mile spacing. On minor arterials and couplets, full median breaks should be no closer than 1/8 mile intervals. In built up areas, where reasonable alternate access is not available, median openings may be provided at smaller intervals with the approval of the Engineering Department.

(2) Configuration of Median Openings

If the street intersection legs intersect at an angle of 88 to 90 degrees, the configuration of the median opening is to be determined by the information on Detail G-3224. If the streets intersect at an angle less than 88 degrees, the median opening configuration will have to be determined to the satisfaction of the City Engineer.

(3) Cross-Slope

The cross-slope in the median opening shall be limited to 0.02 ft/ft. Median openings on curves with superelevation exceeding 0.02 ft/ft will not be permitted.

- b. Flush Medians
Flush, painted medians are required on major, minor and local collector streets.

4.1.4 Street Access and Driveways

All driveways serving property abutting public streets in the City shall conform with the following guidelines:

A. Driveway Design

- 1. Width
The width of a driveway shall be the width at the throat of the driveway exclusive of wings or return radii.
- 2. Distance between driveways
The distance between the near edges of the driveways as defined by top of transition (Type MAG Std. Det. 250) or by curb return (MAG Std. Det. 251 or G-251).
- 3. Construction
 - a. Residential Driveways:
With straight curb - Replace curb per MAG Std. Det. 250.
 - b. Commercial Driveways and Private Streets:
Roll and straight curb - Replace curb per Detail G-3250 or G-3251.

- B. Notwithstanding the provision of these standards, where ample justification exists, the City may approve driveways up to a maximum width of 30 feet.

C. Driveway Spacing

Exhibit No. 10 lists the minimum driveway spacing measured from driveway centerline to driveway centerline, which is acceptable for the indicated types of land use.

A maximum of one driveway opening shall be permitted to a particular site or parcel from each of any one or two abutting streets. One additional driveway entrance may be permitted by the City Engineer when projected travel demands indicate it is in the interests of good traffic operation, and adequate street frontage exists to maintain the above guidelines.

D. Driveway Location Limitations

A new access driveway will not be allowed (measured to the driveway centerline):

1. Within 30 feet of any commercial property line except when it is a joint-use driveway serving two abutting commercial properties and access agreements have been exchanged between, and recorded by, the two abutting property owners.
2. When the total width of all driveways serving a property exceeds 50% of the curb line frontage.
3. Within 50 feet of the right-of-way line of an intersecting non-arterial street.
4. Within 100 feet of the right-of-way line of an intersecting arterial street.
5. Within 100 feet of an approved median opening location on an arterial street.
6. Less than the minimum spacing as established by Exhibit No. 10

E. Protection of Access

Except at approved access points, for proper control of driveway access, a vehicular non-access easement shall be granted to the City along all arterial streets when abutting property develops.

F. Residential Development Driveways

1. **Single Family Residential Development**
Driveways serving single family residential units should be S-1 type driveways as shown on Detail G-3224. Only one driveway per lot street frontage is allowed. The minimum driveway length is 20 feet, measured from the face of the garage opening to the back of sidewalk or the back of curb if no sidewalk is provided.
2. **Multi-Family Residential Development**
The M-1 and M-2 type driveways shown on Detail G-3254-1 are to be used to serve multi-family developments. Type M-1 is a low-volume driveway serving more than three off-street parking stalls for more than two dwelling units. Type M-2 is a high-volume driveway serving more than 50 dwelling units and is normally on a major collector or an arterial street. With the City Engineer's approval, type M-1 and M-2 driveways may be widened up to 10 feet on the egress side to provide for a separate left-turn lane. The minimum driveway length is 20 feet, measured from the entrance to the off-street parking area to the back of sidewalk, or to the back of curb if no sidewalk is provided.

3. Limitations on Residential Access

- a. Residential properties that have frontage on a local street as well as on an arterial or collector street shall only access the local street.
- b. In some instances, residential parcels fronting only on an arterial or collector streets may be given access if alternate public access is not available. When such access is allowed, the driveway must be circular or it must have a turn-around area to ensure that there is no need for backing onto the street.

G. Commercial and Industrial Development Driveways

Driveways for commercial and industrial development are shown on Details G-3254-2 through G-3254-3. Detail G-3254-2 depicts the “CH” type driveways, and Detail G-3254-3 depicts the “CI” type driveways. The minimum length for a commercial or industrial driveway is 30 feet, measured from the entrance to the off-street parking area to the back of sidewalk or the back of curb if no sidewalk is provided.

1. Commercial Driveways

The “CH” type driveway shall be used to serve commercial properties. A “CH” type driveway is to be used for driveways on arterials, major collectors, and high volume minor collectors, or at other locations when required by the City Engineer. The CH-2 and CH-3 type driveways are to be used at all access driveways opposite median openings.

2. Industrial Driveways

The CH-1 type driveway shall be used to serve industrial properties. Except under unusual circumstances, other “CH” and “CI” driveways are not allowed in industrial areas. When the City Engineer allows them, the related requirements of commercial driveways shall apply. Generally, industrial access is not permitted on arterial or major collector streets; however, if the City Engineer allows such access, commercial driveway standards shall apply.

H. Non-residential Driveway Grades

Driveway profile standards are illustrated in Detail G-3258.

I. Deceleration Lanes

1. Deceleration lanes may be required on streets in conjunction with driveways and may require additional right-of-way. The lane length must be determined on a case-by-case basis and must be approved by the City Engineer.
2. Deceleration lanes are required when all of the following factors are determined to apply:
 - a. At least 5,000 vehicles per day are using or are expected to be using the street.
 - b. The 85th percentile traffic speed on the street is at least 35 miles per hour; or 45 miles per hour for a two lane (one lane each direction) roadway.
 - c. At least 30 vehicles will be making right turns into the driveway during a one-hour period.

4.1.5 Sidewalk Areas

Developers are encouraged to enhance visual quality of sidewalk areas by the use of detached sidewalks adjacent to streets. Sidewalks to remain within City's Right-of-way or within an easement.

4.1.6 Bridges, Retaining Walls and Structural Clearances

A. Bridges

1. Bridge Roadbed Width
The clear width of all bridges, including grade separation structures, shall equal the full width of the physical improvements consisting of sidewalk, street, median, and curb and gutter.
2. Approach Guardrail
If a vehicular railing or safety-shaped barrier is provided which is within 10 feet of a traveled way with or without a sidewalk, approach guardrails shall be installed on all approach ends in accordance with AASHTO guideline and paragraph 4.1.6.A.4.d. below.

3. Cross Slope

The crown is normally centered on the bridge except for one-way bridges, where a straight cross slope in one direction shall be used. The cross slope shall be the same as for the approach pavement.

4. Railings

The railings to be used are the State of Arizona Department of Transportation standard design railings. There are four types of railings, which are described below:

a. Vehicular Barrier Railings

- (1) The primary function of these railings is to retain and redirect errant vehicles.

b. Combination Vehicular and Pedestrian Railings

- (1) These railings perform the dual function of retaining both vehicles and pedestrians on the bridge. They consist of two parts:
 - a concrete barrier railing with a sidewalk
 - a metal hand railing or fence-type railing

c. Pedestrian Railings

These railings prevent pedestrians from accidentally falling from the structure and, in the case of the fence-type railing, prevent objects from being thrown to the roadway below the bridge.

d. Bridge Approach Railings

- (1) Approach railings are required at the ends of bridge railings exposed to approach traffic. On divided highways, with separate one-way traffic structures, they shall be placed to the left and right of approach traffic.
- (2) On two-way roadbeds with a clear width less than 60 feet across the structure, approach railings shall be placed on both sides of the structure.

- (3) When the clear width is 60 feet or more, approach railings shall be placed only to the right of approach traffic.
- (4) Several types of approach railings are available, including Metal Beam Guardrail, Bridge Approach Guardrail (Types I and II), and Safety-Shape Barriers. The type of approach railing selected should match the rail to be used on the bridge. When long runs of guardrail (such as embankment guardrail) precede the bridge, the guardrail should connect to the bridge railing and thus serve the approach railing function.
- (5) Approach railings shall be flared at their exposed end. The greatest flare offset possible should be used commensurate with the approach roadway. For detailed information, refer to the AASHTO publication, Roadside Design Guide.

B. Retaining Walls

1. Types and Uses

Recommended types of retaining walls include reinforced concrete and structural masonry. Heavy timber construction is not encouraged except when approved by the City Engineer. The walls shall also include integral attachments for railing and weep drainage where applicable.

2. Aesthetic Considerations

- a. In general, the materials and design of retaining walls shall match or blend with the adjacent natural features, landscaping, and / or buildings. The surface of the retaining wall should have a low light reflectance. Suggested surface treatments include exposed aggregate, stucco or mortar wash, and native stone, or other surfaces as approved by the Development Review Board.
- b. The height of retaining walls shall not exceed 6 feet except when approved by the City Engineer. If approved to retain above 6 feet, terracing is encouraged and the length of the

alignment of the retaining walls should be foreshortened by vertical grooves, periodic offsets, and height changes, or other configurations as approved by the Development Review Board.

3. Safety Railings

A safety railing is required on or adjacent to vertical faces such as retaining walls, wing-walls, abutments, etc., and where the vertical fall is 2 feet or more. The safety railing shall be constructed per City of Goodyear standard details and shall be placed on top of the vertical face structure of the vertical drop.

C. Structural Clearance

1. Horizontal Clearance

- a. A fixed object other than street lights, signal poles, utility boxes and utility poles, will not be allowed within 10 feet of the traveled way unless approved by the City Engineer and a safety barrier is provided.
- b. A lesser clearance may only be allowed when other controls make the desired clearance unreasonable and appropriate traffic barriers are installed. In no case shall a fixed object be allowed within 2 feet of a traveled way.
- c. The horizontal clearance to bridge piers, abutments, and retaining walls on all streets shall be not less than 10 feet from the edge of the traveled way.

2. Vertical Clearance

- a. The minimum vertical clearance shall be 16.5 feet over the entire width of the traveled way of an arterial street or major collector street.
- b. On other streets, the minimum shall be 14.5 feet. Exceptions must be submitted to, and approved by, the City Engineer.

4.1.7 Side Slopes

A. Side Slope Standards

Side slopes should be designed for functional effectiveness, ease of maintenance and pleasing appearance.

1. For areas greater than 10 feet back of curb, slopes of 4:1 or flatter shall be provided.
2. Steeper slopes may be approved in areas more than 30 feet back of curb when soils are not highly susceptible to erosion, or when a cut is not more than 4 feet.
3. Consult the AASHTO publication, Roadside Design Guide for further details. Cuts or fills greater than 4 feet must be reviewed by the Development Review Board.

B. Slope Rounding

The top of all cut slopes shall be rounded where the material is other than solid rock. A layer of earth overlaying a rock cut also shall be rounded. The top and bottoms of all fill slopes for, or adjacent to a traveled way, sidewalk, or bicycle path shall also be rounded.

4.1.8 Construction of Less Than Ultimate Cross-Section Improvements

- A. A full street cross-section is required for the interior streets of a development and a complete half-street cross-section for the perimeter streets.
- B. If the street is a major arterial, four of the six lanes of the full street or two of the three lanes of the half-street may be required.
- C. The determination as to whether the unconstructed lanes will be on the outer edge of the cross-section or adjacent to the median location will be made on a case-by-case basis and approved by the City Engineer.

4.1.9 Construction of Half-Streets

Construction of half-street are discouraged and shall only be permitted with written approval in a Development Agreement.

4.1.10 Pavement Transitions

When development causes the widening of a portion of the pavement of an existing road, pavement transitions are required at each end of the widened portion. Design of the various features of the transition between pavements of different widths should be consistent with the design standards of the superior facility. The transitions should be made on a tangent section whenever possible. Locations with horizontal and vertical sight distance restrictions should be avoided. Whenever feasible, the entire transition should be visible to the driver of a vehicle approaching the narrower section. Intersections at grade within the transition area should be avoided.

- A. Transition to a Wider Pavement Section
A transition from a narrower cross-section to a wider cross-section shall have a length that is five times the street design speed in miles per hour. See Detail G-3214.
- B. Transition to a Narrower Pavement Section
A transition from a wider cross-section to a narrower cross-section shall have a length equal to the difference of the two widths in feet times the street design speed in miles per hour or the 85th percentile speed in miles per hour, whichever is greater. Detail G-3214 illustrates this requirement.

4.1.11 Subdivision Street Planning

Subdivision street plans should produce the minimum number of intersections and wash crossings, and discourage through traffic. The following paragraphs describe certain other concepts and requirements.

- A. Existing and Proposed Streets
Existing streets and proposed streets of the applicable Master Circulation Plan, should be incorporated into the design of new subdivisions. Exceptions shall be approved by the Engineering Department and may require the approval by the Development Policy Committee.
- B. Street Abandonment
An existing street may be abandoned if it is not a street indicated in the Circulation Element of the General Plan or an Area Plan and will not eliminate reasonable access to existing properties. The abandonment must occur prior to the submittal of a final plat to the City Council.
- C. Cul-de-Sac Street Lengths
A cul-de-sac street is a street that serves more than one property owner and has only one direct access to the public street system.
 - 1. The following requirements apply to both public and private streets.
 - a. The length of a cul-de-sac is measured between the centerline of an intersecting street and the radius point of the cul-de-sac.
 - b. A cul-de-sac street shall not be longer than 1,500 feet and it shall not serve more than 25 single-family dwelling units.

D. Dead-End Streets

1. Dead-end streets will be required where a street connection is necessary to serve adjacent properties that will develop at a future date.
2. When a dead-end street is required and it serves more than four lots, a temporary cul-de-sac shall be provided. In addition, the minimum/maximum length of a dead-end street shall be the same as that of a cul-de-sac street.

E. Bubbles

Bubbles are areas on the roadway expanded to provide a turn-around and additional access or lot frontage on minor collector and local streets.

1. Bubbles are required at intersections where each street extends in only one direction from the intersection.
2. Bubbles are permitted between intersections to improve accessibility to odd-shaped sites or on minor collector streets where direct access is not permitted.
3. The use of bubbles (except for a cul-de-sac) on other than local residential streets must be approved by the City Engineer.
 - a. Radii appropriate for these bubbles will be established as part of that approval.

F. Alleys

Alleys are not permitted in residential development in City of Goodyear.

G. Offset Intersections

1. Street jogs with centerline offsets less than 250 feet shall not be permitted along arterial and major collector streets, or on minor collector and local commercial and industrial streets where interlocking left turns will occur.
2. Offsets as small as 125 feet are allowed on minor collector and local commercial and industrial streets where interlocking left turns will not occur and on local residential streets.

H. Intersecting Tangents

A tangent section of roadway is desirable prior to an intersection on a curvilinear street. Minor street intersections with major streets shall have a minimum tangent outside the intersecting right-of-way.

4.1.12 Standards for a Development

A. Preliminary Design Report for Development

A preliminary design report shall be submitted prior to or at the time of preliminary plat submittal. At a minimum, the preliminary report must address the following subjects:

1. Vehicle Trip Generation
2. Roadway Classification
3. Design Speeds
4. Auxiliary and Additional Lane Requirements
5. Parking Requirements
6. Pedestrian, Bicycle, and Equestrian Requirements
7. Special Features and their Influence

4.1.13 Technical Reports

A. Traffic Impact

Developers are responsible for submitting a "Traffic Impact Analysis for Proposed Development", as outline in ADOT Publication 35-209, and a traffic circulation study.

B. General Information

1. Developers are responsible for submitting a Design Study Report to validate the design shown on the construction plans. The Design Study Report should not be excessively long or complex. Rather it is to briefly: describe the basis of the design and the assumptions made; explain "special" solutions to problems encountered; etc.

2. The following sections shall be contained in the report.
 - a. Soils Report

A "Soils Report" shall be submitted with new street construction plans indicating "R" value, sieve analysis, plastic index of the subgrade, and street structural cross section design.
 - b. Drainage Report

A "Drainage Report" shall be submitted with new street construction plans and/or the grading plans. This report shall be prepared per Chapter 4.0 and the "Storm Drainage Collection and Retention Manual".
 - c. Pavement Evaluation Report
 - (1) A "Pavement Evaluation Report" shall be submitted with new street construction plans when it is proposed to match existing pavement. The design engineer is responsible for investigating and evaluating the existing pavement structure.
 - (2) If the existing pavement does meet requirements, it may be matched by trimming a minimum of one (1) foot for a longitudinal match, or two (2) feet for a perpendicular match. Exact point of matching and method of trimming (sawcut or wheelcut) shall be determined in the field by the City.
 - d. Supplemental sketches, details, calculations, and design rational.

4.1.14 Technical Design Requirements By Street Classification

- A. Design shall conform to Section 15-3-3 of the Street Design of the Subdivision Regulation. Copies of the City of Goodyear Subdivision Regulations are available at the City of Goodyear Community Development Department, Planning and Zoning office.

4.1.15 Construction

- A. All construction shall conform to the latest MAG Standard Details and Specifications together with the Goodyear Supplement to MAG.
- B. A right-of-way Construction Permit is required for all work within the right-of-way.

- C. A 100% Performance Bond or equivalent, as acceptable to the City, is required for all work within the right-of-way.
- D. All contractors working within the right-of-way shall provide the City with proof of insurance in a form and with limits of coverage acceptable to the City.
- E. All work within the right-of-way shall be inspected and approved by the City.
- F. All newly constructed public ways shall be kept barricaded and access denied to the public until such public way is accepted by the City and all traffic control devices are installed to the approval of the City.

4.1.16 Radius to Back of Curb for the Return

Street Classification	Arterial	Secondary	Collector	Residential Interior
Arterial	35'	30'	20'	20'
Secondary	30'	30'	20'	20'
Collector	20'	20'	20'	20'
Residential Interior	20'	20'	20'	20'

4.1.17 Traffic Signals

Signal poles bases and conduit with pull boxes, per the City of Goodyear details, shall be provided at all arterial and secondary street intersections. An approved traffic preemption device shall be installed on all new traffic signals.

Deviation from these standards shall be approved by the Public Works Director.

4.1.18 Street Lights

STREET LIGHT STANDARD

STREET TYPE	LUMINAIRE	MIN AVE FC	HGT FT.	SPACING MIN/MAX	POLE SPACING
RESIDENTIAL	9,500	.3	35	190/210	(1) ONE SIDE
LOW VOLUME COLLECTOR	16,000	.3	35	190/210	ALTERNATING
HIGH VOLUME COLLECTOR	16,000	.3	35	200/200	MEDIAN
MINOR ARTERIAL	30,000	.7	35	175/225	ALTERNATING
MINOR ARTERIAL	30,000	.7	35	200/200	MEDIAN
MINOR ARTERIAL	50,000	.7	35	250/250	ALTERNATING
MAJOR ARTERIAL	30,000	.7	35	175/225	ALTERNATING
MAJOR ARTERIAL	30,000	.7	35	200/200	MEDIAN
MAJOR ARTERIAL	50,000	.7	35	250/250	ALTERNATING

Notes:

Residential Streets

- A. One light to be installed at intersections and head of tee intersections.
- B. Lights are to be installed in cul-de-sacs that are greater than 200 feet.

4.3 TRANSIT

4.3.1 Introduction

A. Purpose

1. This section documents transit facility guidelines for Goodyear public works projects and for developers working on projects that will impact the transit system. This includes projects that create high-activity centers such as shopping malls or high-density living areas.
2. Criteria are documented for locating bus stops and transit amenities such as bus benches and transit shelters. It includes street geometrics for bus bays, standard signage and review and submittal requirements. There is also a brief discussion on landscaping as it relates to transit amenities.
3. The guidelines consider the needs of the transit user, the bus operator, neighbors adjacent to bus stops and the general public.

B. Applicability

1. The information presented in this document is intended for use by engineers, developers and City staff.
2. These guidelines are generalizations applicable to most situations. They are not intended as detailed engineering solutions; each site will have its own unique set of needs. Rather, transit-related design solutions may need to be adjusted to fit specific sites and applicable codes.
3. Developers are responsible for obtaining all city approvals and permits necessary to complete the transit improvements.

C. Goals

1. The goal of these guidelines is to provide a clean, safe, comfortable and convenient environment for user of Goodyear's transit system and to provide developers a framework in which transit amenities are stipulated for new projects.

2. All transit improvements will be designed to meet the regulations set forth by the Americans with Disabilities Act (A.D.A.).

4.3.2 Criteria For Bus Stop Locations

A. Bus Stop Specifications

1. Frequency of bus stops is dictated by the degree to which bus patrons are willing to walk to board a bus. The minimum standard for bus stop locations in Goodyear is at quarter mile intervals for residential areas and one-eighth mile intervals at all minor arterials.
2. In order to provide the greatest convenience and safety for passengers, bus stops are generally located as close to intersections as possible. This minimizes walking distance for transferring passengers and encourages the use of sidewalks. Far side stops, those located immediately past an intersection, are optimal for the following reasons:
 - a. Minimal interference with traffic flow
 - b. Minimal interference with intersection sight distance
 - c. Less likelihood of passengers crossing in front of a bus
 - d. Less conflict for automobile right turns
 - e. Less obstruction for vehicles entering the intersection from a side street
 - f. More effective re-entry for bus into the traffic stream
3. Near-side bus stops (those stops located immediately before an intersection) are considered when placement of far-side stops is not feasible or when that stop will be located near buildings with high volumes of transit riders. These types of stops may also be located where a high-volume bus transfer location would otherwise require a pedestrian crossing at a busy street.
4. On occasion a mid-block bus stop may be utilized to provide access to a major generator, but it is generally discouraged due to the likelihood that pedestrians would cross streets mid-block rather than at an intersection.

5. The location of a transit stop is generally 85 feet, plus or minus 25 feet from the curb of an unsignalized intersection and 120 feet, plus or minus 25 feet from a signalized intersection. The paved loading area should be clear of any obstructions.
6. Where a development or subdivision is walled-off from the street, steps should be taken to allow easy pedestrian access. This could include a pedestrian access path linking various sections of the development to the bus stop or a system of offset walls around developments which allow pedestrian passage.
7. All transit stop furniture must be placed outside the standard five-foot sidewalk. A minimum three foot clearance is required between transit components and fire hydrants, switch boxes, mail boxes, etc.

B. Accessibility

1. All transit facilities must comply with the applicable provisions of the Americans with Disabilities Act. In general, a 36" clearance is to be maintained between bus stop components to allow for maneuvering by wheelchairs. A minimum clear length of 96 inches (measured from the curb or roadway edge) and a minimum clear width of 60 inches (measured parallel to the roadway) shall be provided at transit locations where a lift or ramp is to be deployed.

4.3.3 Transit Amenities (as determined by City Council)

Construction shall be in accordance with adopted Council Action or Policy per five year Capitol Improvement Plan.

- A. Comfortable and secure passenger waiting areas should be provided at as many bus stops as feasible. The waiting areas may include a varying range of improvements depending upon ridership and specific needs. Below are typical transit amenities and conditions under which they should be employed.

- B. Advertising signs are not allowed by city ordinance.

1. Benches

- a. Benches are located at bus stops where the concentration of waiting passengers is not sufficient to warrant provision of a bus shelter.

- b. Several styles of benches have been approved for placement in Goodyear. Specialty benches are used in downtown Goodyear. A plastic-coated blue bench with matching trash receptacle is used in all other areas.

2. Shelters

- a. Shelters are located at bus stops where studies show a concentration of waiting passengers at exposed locations. Shelters are appropriate along arterial or collector streets, or adjacent to high-activity centers. In a development, any requirement for bus shelters may be waived if adequate exterior shading and architectural shelter is provided by the developer.
- b. Shelters should be arranged with consideration to the sun's angles. Coverage should allow for maximum shade during the peak use hours of the summer morning and afternoon. The shelter should be oriented, however, to allow the bus driver clear visibility of the passenger and allow passengers a view of oncoming traffic.
- c. Goodyear has a standard shelter design. Plans and specifications are available upon request from the Public Works Department. Other shelter designs may be used provided it is approved by the City and the Development Policy Committee. Shelter designs must meet the following criteria:
 - (1) Minimum canopy of 65 square feet with a minimum width of 5.5 feet
 - (2) Minimum 7 feet clearance between underside of roof and sidewalk surface
 - (3) Shelter canopy will be waterproof with provisions for drainage away from transit users
 - (4) Seating areas will be shaded
 - (5) Provide security for transit passengers

- (6) Have a minimum 6 inches vertical clearance from the sidewalk to avoid collection of trash and debris
- (7) Trash receptacle with a minimum capacity of 30 gallons
- (8) Fixed components to prevent unauthorized removal
- (9) Materials will allow for air circulation and avoid containment of hot air
- (10) Materials must be finished to prevent overheating
- (11) Canopy materials that collect and radiate heat will be insulated
- (12) Minimum of 6 linear feet of seating located under the shelter canopy
- (13) Materials, coatings and surfaces will be graffiti resistant
- (14) Components of the shelter will be readily replaceable
- (15) Colors respond to the architectural character of the development and the transit system (Per review and approval of the Development Policy Committee)
- (16) Transit information holder will be placed in a well-lit portion of the shelter
- (17) Bus Stop graphics per City requirements
- (18) Minimum two foot clearance between roof canopy and face of curb

C. Bus Bays (Pullouts)

- 1. Bus bays enable buses to pull completely out of the traffic lane while loading and unloading passengers.

2. Two types of bus pullouts are allowed:
 - a. Far-side
 - (1) Far-side pullouts reduce walking distances for bus transfers and encourage patrons to use intersection crosswalks.
 - b. Mid-block
 - (1) Mid-block pullouts occur between intersections or when a physical obstruction prevents the placement of a far-side pullout.

D. Park and Ride lots

1. Park-and-ride lots provide free automobile parking and allow patrons convenient access to public transit. These facilities may be combined with transit centers or major transfer centers. They are also found at shopping malls and near large employment centers.
2. The purpose of park-and-ride lots is to intercept automobile trips close to their origin and to transfer patrons to buses for the remaining portion of the trip.
3. Park-and-ride lots should be located in conformance with the Goodyear Transportation Master Plan. Additionally, these lots should be located at express bus route stops at major activity centers.

E. Major Transfer Centers

1. Major transfer centers are high capacity transfer destination points where several buses converge. These facilities provide a convenient location for bus passengers to transfer between routes. They also typically provide direct pedestrian access to major activity centers.
2. Transit centers include permanent facilities with a high level of transit amenities such as shelters, bike lockers, drinking fountains and information kiosks. They may be constructed off-street to include a bus turn-around loop or on street where major transfer activity occurs between intersecting or converging bus routes.

3. Criteria for locating major transfer centers are:
 - a. Where regional and local bus routes intersect or
 - b. At transfer points between two or more regional bus routes
 - c. Near crossings of major arterial streets
 - d. Adjacent to or in major activity centers
 - e. At park-and-ride lots which are located in areas meeting one of the above criteria
4. Transfer centers, or transit centers as they are also known, are typically a minimum of 1.5 acres and accommodate at least 45 parking spaces.
5. Refer to the Goodyear Transportation Master Plan for proposed locations for both transit centers and park-and-ride lots.

F. Landscaping

1. Shade trees and other protective landscaping should be provided wherever possible. This landscaping could be considered part of the development's frontage landscape and could count towards any landscaping requirements which may apply. Considerations for selection and location of landscaping include:
 - a. Trees should be mature and have an adequate canopy to shade the seating area
 - b. Low-water consumption trees and shrubs should be used
 - c. Tree location should consider the solar orientation of the transit stop. Priority should be given to shading afternoon summer sun
 - d. Transit landscaping should be compatible with other frontage landscaping
2. All landscaping shall be carefully located so as not to obstruct the visibility of either the transit user or the bus operator. The developer/property owner shall be responsible for the maintenance of landscaping at bus stops.

4.3.4 Signage

A. Bus Stop Signs

1. The placement of bus stop signs is an important passenger convenience, operations and marketing tool for transit systems. Bus stop signs are positioned to notify passengers that the bus will stop at that specific location. They serve as a reference for bus operators and as a point of identify for the transit system.
2. The bus stop sign is generally not a traffic sign (except as noted below) since it is not displayed to regulate or warn motorists.
3. A regional bus stop sign is currently in use throughout the Valley. The sign is 18" wide by 24" high, reflectorized for nighttime visibility and is double-faced so that it can be seen from both directions. The upstream side of the sign may contain "No Parking" information for motorists approaching the bus stop.
4. The standard regional sign identifies a location as a bus stop and includes the name and number of the bus route(s) being served and the transit information telephone number.

B. Sign Placement

1. Bus stop signs must be placed at the location where people board at the front door of the bus. In cases where the bus stop sign is incorporated into the design of a transit shelter, the need for a separate sign is diminished.
2. Ideally, bus stop signs must be placed at the location where people board at the front door of the bus. In cases where the bus stop sign is incorporated into the design of a transit shelter, the need for a separate sign is diminished.
3. Bus stop signs should be installed on sign posts or metal poles so that the sign is "flagged". In other words, the sign should be attached to the post by its edge. This allows both sides of the sign to be viewed without obstruction. The bottom of the sign should be seven feet above ground level, at least two feet from the curb face and away from obstructions such as landscaping or other signs. The standard regional sign has been designed so that it may be mounted by its edge to a two inch post without obscuring

the backside message. Where metal street light poles are at the proper location by too close to the curb, the signs may be flagged away from the street.

4.3.5 Bus Stop Maintenance

- A. Well maintained bus stops are crucial to the image of the transit system. Damaged furniture and trash build-up should be tended to immediately to create a positive impression for transit patrons and the general public.
- B. Regular maintenance should include:
 - 1. Full wash down of shelter and accessories
 - 2. Removal of all dirt, graffiti, and pasted material
 - 3. Litter pick up around stop or shelter/accessories to a distance of ten (10) feet
 - 4. Manual or chemical removal of weeds
 - 5. Pruning of obstructing tree growth
 - 6. Touch up of paint scratches
- C. The developer shall maintain the bus stop for a two (2) year period. Repair of items that pose a safety problem should be performed within twenty-four (24) hours. Repairs that do not pose safety problems should be completed within three (3) days.

4.3.6 Submittal Requirements and Review Procedures

- A. The following facilities must be delineated on the preliminary site plan or the preliminary plat submitted to the city:
 - 1. Major transfer centers
 - 2. Bus stops
 - 3. Park-and-ride lots
 - 4. Bus bays
 - 5. Shelters
 - 6. Bus benches
- B. The design and location of the above mentioned facilities must be approved by the City during the development approval process.

- C. Developers may deposit funds in lieu of construction and installation of stipulated transit amenities. The amount of funds to be deposited are determined during the project review process and are in force upon City Council approval of the project.

4.4 BIKEWAYS

4.4.1 Introduction

A. Preface

1. These Design Standards and Policies as presented in this section are derived primarily from the “Arizona Bicycle Facilities Planning and Design Guidelines as prepared by the Facilities Planning Committee, Arizona Bicycle Task Force, November 1, 1988. Additional references include the Guide for the Development of Bicycle Facilities (AASHTO) August 1991, and the Manual of Uniform Traffic Control Devices (MUTCD).

B. Purpose

1. This Section has been prepared for development and improvement projects, both private and public, within the City of Goodyear. The use of this Section will assist in establishing uniform bicycle facilities in Goodyear and throughout the region, and will be in conformance with Federal and State Highway Administration Guidelines.

C. Philosophy

1. The City of Goodyear, in compliance with the Arizona Revised Statutes (ARS 28-812) recognizes the bicycle as a vehicle and is therefore entitled to share the roadway with other vehicles, except where expressly prohibited.

D. General Plan Circulation Element

1. The current Circulation Element of the General Plan, as adopted by the Goodyear City Council, is designed to provide for the safe and efficient movement of people and goods in the City. The Bicycle Facilities Plan is a major section of the Circulation Element and should be used as a reference.

E. Definitions

1. Bikeway: Any road, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

2. Bicycle Lanes: A portion of the roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists.
3. Bicycle Routes: Shared facilities to provide continuity to other bicycle facilities (usually bike lanes) or to designate preferred routes through high demand corridors (Routes may be signed but not striped).
4. Bicycle Path: Physically separated from motor vehicle traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way.

4.4.2 Location Criteria

A. Accessibility

1. Bicycle facilities should be located along a route where use can be maintained.
2. Strong consideration should be given to access points (more frequent and convenient will increase usage).
3. Bikeways should serve activity centers along a direct course.
4. Barriers such as freeways, canals, railroad tracks, etc., should be avoided or corrected with proper facility crossings.
5. Routes should be developed that minimize delays for the cyclist.
6. Stop signs should be oriented to restrict cross traffic rather than the bike route.

B. Safety

1. Bike paths and pedestrian paths should be separate, per Arizona Bicycle Facilities Planning and Design Guidelines and COG Details.
2. Two-way paths immediately adjacent to a roadway should be discouraged.
3. Sidewalks should be used only under very special conditions.

4. Bicycle lanes should be one-way and in the same direction as vehicular traffic.
5. Bicyclists are required by Arizona Statutes to follow all “rules of the road”.
6. Traffic volumes must be considered for on road bicycle facilities.
7. Truck and bus traffic should comprise less than 5% of roadway volumes for bike routes (5% may be exceeded for bike lanes).
8. Roadways should have a smooth surface, but not slick. Utility covers and drainage grades should be flush with grades designed to allow crossing.
9. Ease of maintenance must be included in the design process.
10. High density and turnover of on-street parking should be avoided.

C. Security

1. Bicycle parking devices should be provided at both the trip origin and destination that provide for protection from theft and damage. Long term and short term facilities should be considered depending on destination use (i.e., work, library, etc.).

D. Riding Environment

1. Air quality should be considered and roadways with heavy, slow traffic should be avoided.
2. Scenic value is particularly important along a recreation use bike path.
3. Steep grades greater than 6% uphill should be avoided.

4.4.3 Selection Criteria

A. Bicycle Paths

1. Paths should be used to serve corridors not served by streets and highways.
2. Paths should offer opportunities not provided by the road system.
3. Paths can provide a recreational opportunity, or a high speed commuter route.

B. Bicycle Lanes

1. Designed for preferential or exclusive use of bicyclists.
2. Should be established along streets with significant bicycle demand.
3. Special effort should be made to ensure that appropriate levels of service are maintained including sweeping, lane markings and lighting where required.
4. The four foot minimum width should be exclusive of curb and gutter.

C. Bicycle Routes

1. Routes are shared facilities and should be developed to provide continuity with other bicycle facilities or as designated preferred routes through high demand corridors.
2. Routes are usually signed but do not require striping.

D. Wide Curb Lanes

1. These are placed along streets in corridors where there is significant bicycle demand on major arterial streets, and are unmarked and unsigned.
2. Wide curb lanes are appropriate where traffic speeds and volumes are tolerable for shared roadway facilities.

E. Shared Roadway (No Bikeway Designation)

1. Streets and highways that may be inherently unsafe for bicycle traffic and inappropriate to encourage additional bicycle traffic.

4.4.4 Design Criteria

A. Roadway Improvements

1. On new roadways curb inlets should be used and drainage grates and covers should be kept out of cyclists' path.
2. Railroad highway grade crossings should ideally be at a right angle to the bicycle facility. Consideration must also be given to the materials on the crossing surface and to the flangeway depth and width.
3. Pavements should be free of holes and bumps and other surface irregularities. Joints should be filled and pavement edges should be uniform and void of "drop-offs". Edges should be level with pavement.
4. Consideration should be given to bicycle crossings when installing traffic control devices. Short clearance intervals should be avoided on multi-lane streets.
5. Wide curb and bicycle lanes are preferred over shoulders.
6. Rumble strips should not be installed on streets designed for bicycle traffic.
7. Wide curb lanes should be 15 feet with 12 foot travel lane and 14 feet with 11 foot travel lane, exclusive of curb and gutter, and the pavement edge should be striped to avoid the operation of two vehicles in one lane.

B. Bicycle Routes

1. Routes should be marked as connectors to other bike facilities and as touring routes. It is desirable to furnish sign information for directional changes and for distance marking for long routes.

C. Bicycle Lanes

1. Lanes should always be on-way and flow in the same direction as adjacent motor vehicle traffic.
2. Lanes should be considered when it is desirable to delineate the rights-of-way assigned to bicyclists and motorists.
3. Lanes may include striped lanes on roadway, use of emergency parking lanes or use of paved shoulders.
4. The minimum desirable bike lane is 4 feet.
5. It is preferable to place bike lanes on the right side of one-way streets.
6. Raised barriers or pavement markers shall not be used to delineate bike lanes.

D. Bicycle Paths

1. Bicycle Paths are facilities on exclusive rights-of-way and with minimal cross flow by motor vehicles.
2. The desirable minimum paved width for a bike path is 8 feet. A two foot minimum graded area should be maintained on each side of the path.
3. In general, the minimum design speed for a paved bicycle path is 20 mph, however, this speed should be substantially less in areas of multiple use, high traffic volume and unpaved surfaces.
4. "Speed bumps" should not be used.
5. Grades should be 5% or less, particularly on long inclines.
6. Sight and stopping distances are important considerations in the design of bicycles paths.
7. Intersections present difficult design considerations, and those with the most favorable conditions should be selected. The ideal intersection design is a grade separation.
8. Signing must be included in the design criteria for both regulatory and informational purposes. General guidelines

for markings are provided in the Manual of Uniform Traffic Control Devices, specifically Part IX.

9. Pavement markings for bicycle paths (and lanes) should follow the same general guidelines as for road markings with particular attention given to non-slip treatment.
10. Pavement selections for bicycle paths should be selected similar to highway selections, with particular care to edges which may be used for emergency or maintenance vehicles. Broom finish or burlap drag concrete surfaces are preferred over trowel finishes.

E. Multi-use Paths

1. In general, multi-use paths and sidewalks are undesirable, and when possible, should be separated from bicycle paths.
2. Motor vehicle use is limited to maintenance and emergency vehicles only.
3. Fixed lighting is highly desirable on paths that may be used at night, for underpasses, at intersections and in areas where security may be a problem.

4.4.5 Traffic Controls

A. Requirements

1. Traffic control devices for bicyclists must adhere to the same five basic requirements as for motorists:
 - a. Fulfill a need
 - b. Command attention
 - c. Convey a clear, simple meaning
 - d. Command respect of users
 - e. Give adequate time for proper response
2. Traffic control devices shall be placed by the City of Goodyear only.

3. The use of colors should conform to code specifications for signs and markings:
 - a. YELLOW - General Warning
 - b. RED - Stop or Prohibition
 - c. BLUE - Service Guidance
 - d. BROWN - Recreation and Scenic Guidance (may be stipulated by the city)
 - e. BLACK - Regulation
 - f. WHITE - Regulation
4. The Uniform Vehicle Code and Model Traffic Ordinance published by the National Committee on Uniform Traffic Laws and Ordinances have provisions for bicycles and are used as the legal basis for control devices.
5. See Appendix A and D of the Arizona Bicycle Facilities Planning and Design Guidelines published by the Arizona Bicycle Talk Force for detailed information on design and placement of signs.

4.4.6 Bicycle Parking

A. Long Term

1. Needed at locations such as employment centers and multi-family developments.
2. Facilities should be provided which secure the frame, both wheels and accessories, and which offer protection from the weather.
3. Bicycle lockers and attended storage areas are examples of long term parking facilities.

B. Short Term

1. Needed at locations such as shopping center, libraries, recreation centers, post offices, restaurants and other quick trip attractors.
2. Should be convenient and located near the building entrances or other highly visible areas.

3. Should be designed so that it will not damage bicycles.
4. Should allow for combined security of both wheels and frames.

4.4.7 Operation and Maintenance

A. Responsibility

1. The agency responsible for control, maintenance and policing of the facility should be established prior to construction.
2. If the bicycle facility is part of the City of Goodyear's Bike Plan, an agreement will be developed between the City and the Developer outlining areas of responsibility.
3. Facilities should be maintained in accordance with provisions contained in other sections of these guidelines.
4. A regular schedule of maintenance should be established for the responsible agency, with provisions for emergency situations such as storms, floods and other natural disturbances, as well as for high participation and special use activities.
5. Appropriate maintenance is necessary for continued use of the bicycle facility.

4.6 TRAFFIC SIGNS AND MARKINGS

4.6.1 Introduction and Definitions

- A. This booklet has been prepared to present the criteria and procedures to be utilized by consultants when performing traffic signing and pavement markings design working and for the City of Goodyear.
- B. The following abbreviations apply herein:
 - 1. AASHTO - American Association of State Highway and Transportation Officials
 - 2. ADOT - State of Arizona Department of Transportation
 - 3. COG - City of Goodyear
 - 4. ITE - Institute of Transportation Engineers
 - 5. MAG - Maricopa Association of Governments
 - 6. MUTCD - Manual on Uniform Traffic Control Devices

4.6.2 Design Specifications

- A. The following publications or their current revisions are to be used in conjunction with the design criteria in this booklet when performing traffic signs and markings design work in the City of Goodyear.
 - 1. "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" - U.S. Department of Transportation, Federal Highway Administration, Current Revision.
 - 2. "SIGNING AND MARKING" - Standard Drawings, ADOT.
 - 3. "TRAFFIC CONTROL MANUAL FOR HIGHWAY CONSTRUCTION AND MAINTENANCE" - ADOT 1989.
 - 4. "POLICIES, GUIDE AND PROCEDURE MANUAL" - ADOT.

5. "SUPPLEMENT TO MAG UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" - City of Goodyear.
6. "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" - MAG.
7. "UNIFORM STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION" - MAG.

4.6.3 Design Standards

A. General

1. Design shall be in accordance with the MUTCD unless modified by the City as noted herein.

B. Signing

1. All sign posts are to be 1-3/4 telespar.
2. "No Parking signs shall be R8-3a (12"x18") modified with a lower arrow plaque. They shall be placed approximately 350-400 feet apart on all arterial and collector street classifications 45 degrees to the curb.
3. Speed limit signs (R2-1) are to be installed at 4 per side per mile.
4. Stop signs (R1-1) are to be 30"x30" minimum size.
5. Street name signs in subdivisions must conform with City colors and standards.
6. Advance street name signs are to be installed at a height of 4 feet to the bottom of sign and placed so that they will not be obstructed by vegetation. Signs shall be installed in medians whenever possible.

C. Striping

1. All permanent pavement striping (lines and crosswalks) shall be 60 mil hot-sprayed thermoplastic. Temporary pavement markings shall be reflectorized traffic paint.
2. COG striping and marking standards are to be shown per MUTCD.

4.6.4 Standard Plan Layout

A. General

1. Signing and pavement marking design shall be shown in the same plan view.
2. Plan sheets are to be complete and to scale 1" = 40' unless otherwise approved by the Public Works Director and the Plan Review Staff.
3. Entire length of project is to be shown in plan view. "Typical Sections" representative of striping and/or signing will not be accepted.
4. Signing and pavement marking plans shall include all existing signing and pavement markings for a minimum of 300 feet past the limits of constructions and shall include all transitions and tapers.
5. Right-of-way lines shall be shown and appropriately dimensioned.
6. Control points shall be stationed and clearly identified.

B. Standard Plan Sheet Notes

1. These notes along with any additional project specific notes shall be placed on the lead signing and pavement marking plan sheet.
 - a. All pavement markings, signing and construction shall conform to Arizona Department of Transportation standard drawings and specifications unless otherwise specified in the "Manual on Uniform Traffic Control Devices", latest edition.
 - b. Traffic control shall conform to the City of Phoenix, "Traffic Barricade Manual", and/or as directed by the City of Public Works Inspector.
 - c. Signs shall be installed on Telespar posts per COG Standard Detail No. G-3140.

- d. All signs that are removed and not reinstalled shall be salvaged and delivered to the Public Works maintenance yard at 200 S. Calle de Pueblo, Goodyear, Arizona.
- e. All lane striping, crosswalks and chevrons shall be 0.060" (60mil) hot sprayed thermoplastic, unless noted otherwise on the plans.
- f. All pavement symbol, arrows and legends shall be type I preformed pavement markings.
- g. Raised pavement markers shall be installed per COG Standard Detail No. G-3210 and ADOT Standard Drawing 4-M-2.02, with a City approved bituminous adhesive.
- h. All existing pavement markings which conflict with proposed markings shall be removed by sandblasting, or City approved method, prior to the installation of new pavement markings. Removals shall be to the satisfaction of the City Inspector.
- i. "No Parking" signs (R8-3a) shall be installed or reinstalled approximately every 350 feet along the length of the project, approximately 5 feet from the back of curb. Band to streetlight poles when feasible.

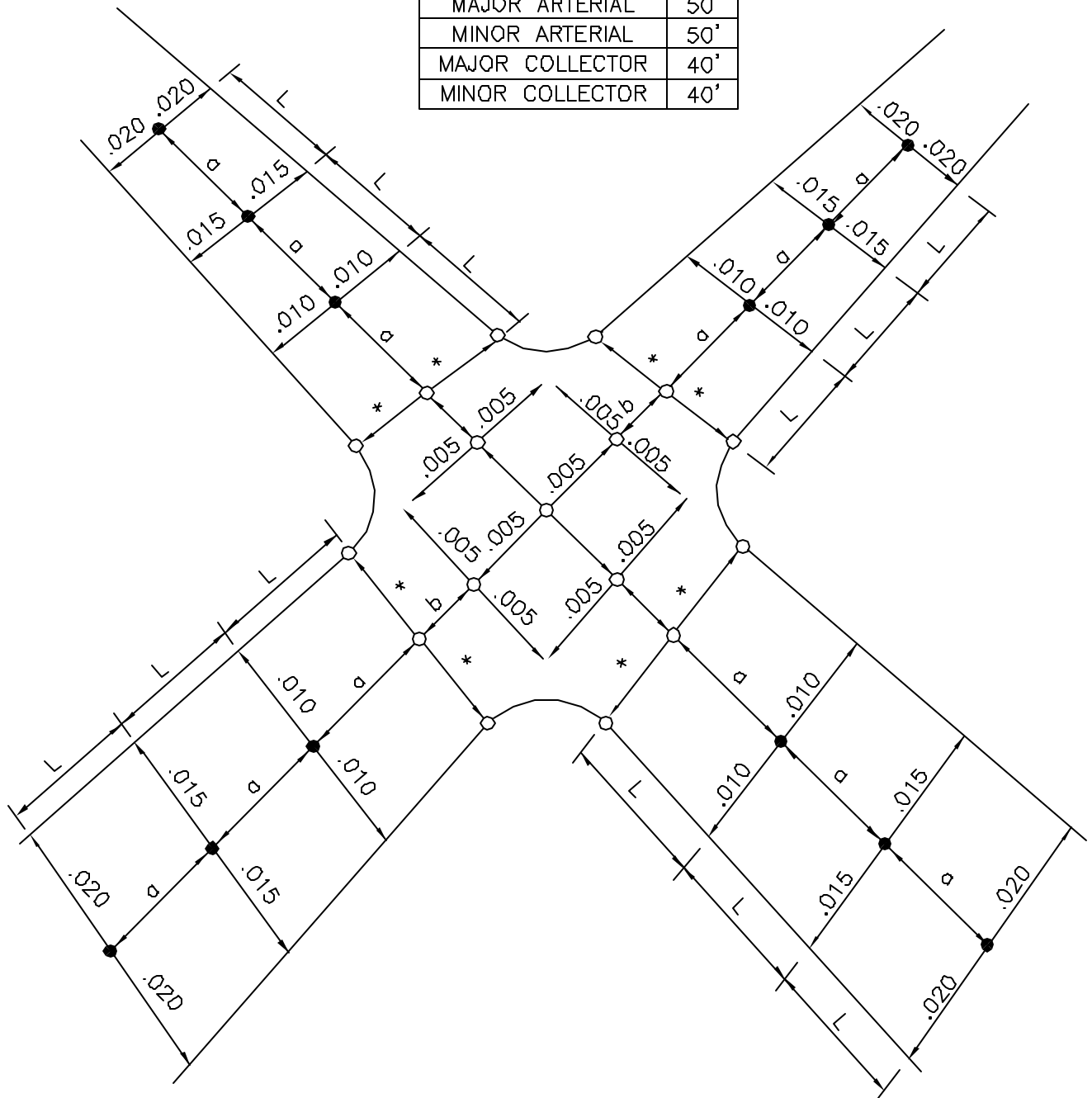
C. Signing

- 1. All signs shall be graphically depicted in the direction of travel.
- 2. All signs shall be stationed and referenced to the appropriate MUTCD sign designation with size noted.
- 3. Existing signs will be identified to remain, be removed or be relocated consistent with note 2 above.
- 4. Consultant shall field verify all existing advance or approach signing applicable to the project. Reference signs on plan sheet including location or station and note status of sign.

D. Striping

1. Existing striping shall be fully shown (as screened lines or lightly inked pen lines), identified by type and width, and completely dimensioned across roadway.
2. Raised pavement markers shall be graphically shown in plan view and referenced by construction notation.
3. All new striping shall be clearly identified noting color and line width.
4. All striping shall be fully dimensioned across roadway and tied to a construction centerline or monument line at each side of an intersection.
5. All pavement arrows, legends, crosswalks, etc. shall be located by station or dimension lines.

STREET TYPE	L
EXPRESSWAY	50'
MAJOR ARTERIAL	50'
MINOR ARTERIAL	50'
MAJOR COLLECTOR	40'
MINOR COLLECTOR	40'



LEGEND

- = As required to match proportionate change
- = Normal centerline grade
- ↔ = Not to exceed .005 in either direction
- = Grade break greater than .01 may require vertical curve
- = Grade break not to exceed .01

	RESIDENTIAL		COMMERCIAL/ INDUSTRIAL	
	SINGLE FAMILY (1)	MULTI- FAMILY (2)	SINGLE BUSINESS (2)	MULTI- BUSINESS (2)
MIN. WIDTH ONE WAY (3)	12'	12'	16'	16'
MIN. WIDTH TWO WAY	24'	24'	24'	24'
MAX. WIDTH	30'	30'	30'	40'
MIN. SPACE BETWEEN DRIVES	n/a	40'	60'	100'
MAX. NO. OF DRIVES	2	2 PER FIRST 19 UNITS 3 PER 1200' FRONTAGE 4 PER 2600' FRONTAGE	2 PER STREET	1 PER 225' FRONTAGE 2 PER 600' FRONTAGE 3 PER 1200' FRONTAGE 4 PER 2600' FRONTAGE

- (1) MAG. STD. DET. 250
- (2) GOODYEAR, STD. DET. 251 SHALL BE USED WHERE WARRANTED BY SUFFICIENTLY HIGH DRIVEWAY USAGE IN THE JUDGEMENT OF THE CITY ENGINEER;
OTHERWISE MAG STD. DET. 250 SHALL BE USED.
- (3) IF DRIVE IS ALSO FOR FIRE EQUIPMENT ACCESS THEN MIN. WIDTH SHALL BE 20'.

NOTES:

1. ALL DRIVEWAY WINGS OR P.C.'S WILL BEGIN 5' FROM SIDE PROPERTY LINE EXTENDED.
2. DRIVEWAY LOCATION AT INTERSECTIONS:
 - RESIDENTIAL DRIVEWAY WINGS MAY ABUTT, BUT NOT ENCROACH INTO, THE P.C. OF THE STREET CURB RETURN.
 - COMM./INDUST. DRIVEWAY ENTRANCE SHALL BE A MINIMUM OF 150' FROM INTERSECTING RIGHT OF WAY LINES ALONG OR ADJACENT TO ARTERIAL STREETS.

5.1 POTABLE WATER SYSTEM DESIGN

5.1.1 General Information

- A. This document provides guidance and minimum design criteria for the modification and construction of water systems within the City of Goodyear. It is intended for use in the planning, design, and plan preparation processes.
- B. Ordinance Requirements
 - 1. The developer shall install, at his/her expense, all on-site and off-site improvements necessary to service the development. This may include pump stations, reservoirs, transmission mains, pressure reducing valves, and other facilities necessary to service the development. This includes payment of all required development fees.
 - 2. Each lot in a subdivision shall be supplied with safe, reliable, and potable water in a sufficient volume and pressure for domestic use and fire protection. This shall be verified by the engineer by performing a flow test of that part of the potable system to be extended, unless previously verified under Preliminary Plat. The flows and pressure must meet minimum requirements for domestic and fire flow requirements. This shall be verified on the cover sheet by the engineer.
 - 3. If the occupancy is to be supplied with domestic service and with fire flows from a storage tank or facility, the engineer must provide a report indicating that sufficient volumes exist as required by the Goodyear Fire Department, and are available to meet calculated fire demands as defined by the engineer.
 - 4. Upon development of property for which City water service is desired and available, the developer shall submit a plan for the water system prepared by a professional engineer licensed in the State of Arizona.
 - 5. The City requires water mains to be installed along the entire length of the property line frontage of the property to be developed, where future extension of the line is possible. The property line frontage is that portion of the property along a public right of way and/or public utility easement. If a parcel to be developed has more than one property line frontage, the City shall also require improvements to be installed along the entire frontage(s).

6. For current information on ordinance requirements, review of the Goodyear Revised Code is recommended.
7. City Policies
Proposed developments determined by the City to have a strong impact on the water system shall be analyzed on the City's computer model at the developer's expense. The effects of peak and fire flows from these developments will be examined to ensure proper sizing and layout of proposed water system elements and to assist the City in planning its own water system facilities to meet the demands imposed by large-scale developments.

C. Private Water Companies

1. Portions of Goodyear's municipal service area are provided water service by private water companies. Private companies are those defined by Arizona Revised Statutes.
2. Modifications or construction of water systems within private water company franchise areas shall be reviewed by the City and the subject company. Goodyear shall review private water systems to City of Goodyear current standards. The applicable review fees shall be paid and a note placed on the drawings delineating operation and maintenance responsibilities. The City cannot provide water service within private water company franchise areas.

D. Design Reports

1. A design report or memorandum shall be required. The design report shall present necessary information concerning design assumptions and computations, demands, pressure and flows, cathodic protection requirements, and rights-of-way or easements that are being provided.

Design report shall address the location of storage facilities serving the site, the adequacy of available storage and the ability to meet fire and domestic flow requirements. Report shall show connection(s) to the existing system supply (size, location, length, etc.) and address whether the failure of any single pipe will disconnect the site from the system.

2. The objective of the report is to provide sufficient information to adequately review the project.

E. Master Plans

1. When required by the City, a Master Water Plan and Report shall be prepared in accordance with the City's Design Standards and Policies by a professional engineer registered in and licensed to practice in the State of Arizona. The Master Plan report shall address, but not be limited to, the following:
 - a. The Master Plan will become the basis for a Water and Wastewater Service Agreement between the developer and the City of Goodyear when such agreement is required by the City. The agreement will specify terms and requirements for water and wastewater service to the development. The introduction to the report should state this.
 - b. All development projects shall be responsible for determining their specific water system needs. Service for proposed developments shall not be produced at the expense of existing customers and the Water Master Plan shall verify this.
 - c. A computer water network model, using the Kentucky Pipe Program for the Analysis of Pressure and Flow in Pipe Distribution Systems, or a similar program approved by the City Engineer, shall verify that adequate pressures and flows will be available within the development. The model shall be provided to the City electronically for purposes of updating the City Water Distribution Model. In addition, if certified flow tests performed on the system to which the project is to be connected do not show that sufficient capacity exists, the computer model shall be used to determine the required on-site and off-site facilities such as pump stations and pipelines necessary to serve the project. If the proposed development requires a change in zoning which increases density or proposes a water system different from the City's current Water Master Policy, then additional off-site calculations will be required.

All model data shall include the following:

- (1) Demands shall be calculated according to densities shown in Table 5-1, Average Day Water Demand Per Dwelling Unit.
- (2) The system shall provide maximum day demands (2.0 times average day demand) plus fire flow. The fire flow used in all calculations should be a minimum of 1,000 gpm for residential under 3,600 square feet and a minimum of 1,500 gpm for multi-family and commercial per the Uniform Fire Code as adopted by the City.
- (3) Verification of the ability to provide peak hour demands (4 times average day demand) shall be provided.
- (4) The minimum required pressure throughout the water distribution system is 40 psi at the highest finished floor elevation. A residual pressure of 20 psi is allowed under fire flow conditions.
- (5) Pipeline calculations shall verify that head loss per one thousand (1,000) feet of any pipe shall be no more than ten (10) ft/ft during peak period demand conditions and not more than eight (8) ft/ft under any maximum day conditions.
- (6) Sufficient supply for demand must be provided without the use of dedicated fire pumps or backup pumps. Calculations which include both domestic demand plus fire flow may use fire pumps as a portion of the supply.
- (7) A computer disk containing all calculations shall be submitted along with the Master Plan report.

d. Each Master Plan must show the following:

- (1) All proposed on-site and off-site facilities including, but not limited to, pump stations, transmission and distribution mains, and reservoirs.

- (2) Proposed street locations, parcel boundaries, and proposed lots within each parcel.
 - (3) Contour lines at two (2) foot intervals showing the elevation of the land surface. Sufficient information must be provided to evaluate network node elevations.
 - (4) All pressure zone boundaries.
 - (5) A separate area location map shall be provided showing existing and proposed streets, as well as existing parcels surrounding the project to a distance of one (1) mile from the exterior boundaries of the project. Assessor's maps can provide the information required to prepare these composite maps.
 - (6) The scale of all maps must be sufficient to show all required information clearly.
2. All water lines which cross golf courses or other open areas shall do so within established roads. If dedicated roads are not practical, then crossing must be within an easement twenty (20) foot wide, or at the discretion of the Public Works Director, or his designee. All other water lines outside dedicated rights-of-way shall be on easements not less than twenty (20) feet wide, or at the discretion of the Public Works Director, or his designee. No walls shall cross these easements.
3. The Water Master Plan must show compliance with the Goodyear Revised Code to construct pipelines, if not already in place, across all dedicated frontages of the development.
4. A construction schedule shall be included in table format for all water related construction required to serve the development, per signed zoning or other agreements.
5. Compliance with the City's current Water Master Policy encompassing the respective area.
6. More specific information regarding master water plan requirements and the City's current Water Master Policy can be obtained by contacting the Public Works Department at 932-1637.

F. Production Systems

1. Wells

- a. The City shall be notified of any proposed well drilling and review plans of all proposed ground water wells.
- b. Under the Arizona Groundwater Management Code, the Arizona Department of Water Resources (ADWR) regulates all groundwater wells in Arizona. Before drilling and installing a well, a “Notice of Intent to Drill” and “Application for a Drilling Permit” must be obtained from and filed with ADWR. The well must subsequently be registered with ADWR. Forms and additional information are available from ADWR Operation’s Division, phone 542-1581.

2. Reservoirs

- a. Storage facilities must provide emergency fire protection and maximize the use of water production facilities. Therefore, storage in each pressure zone shall exceed each of the following criteria:

- (1) Three hours fire flow reserve + 25% of maximum day demand, or;

- (2) One average day demand

3. Booster Pump Stations

- a. Booster pumps shall be designed and required to maintain adequate pressure for domestic and fire protection water supply. City of Goodyear pump system criteria and details available at the Water Operations Division. (All stations shall provide chlorine facilities and telemetry compatible with the Water Operations Division current system.)
- b. Designers shall refer to Engineering Bulletin No. 10 by the Arizona Department of Environmental Quality for additional design criteria. The City shall receive dedicated land for booster stations.
- c. A preliminary or basis of design report shall be prepared and submitted to the City for acceptance prior

to final design. This report shall outline the type of equipment and controls proposed for the station. A final design report prepared by a registered professional engineer licensed in Arizona must accompany all pump station design drawings.

4. Pressure Reducing Valves

- a. Pressure reducing valves (PRVs) shall be required to maintain reasonable pressures within the distribution system.
- b. In general, distribution systems should not be designed to operate at pressures in excess of one hundred-twenty (120) pounds per square inch (psi). PRVs shall be designed in accordance with the criteria delineated in MAG Supplemental Detail No. 2342.
- c. It is important to note that the Uniform Plumbing Code requires a pressure regulator when local water pressure exceeds 80 psi.
- d. The City of Goodyear operates its system from wells and pump stations that commonly have pressures exceeding 80 psi. Changes in demand, supply, and the distribution system also vary the pressure at single family residences. The City may require single family residences to have a PRV installed on service lines. A written variance request may be submitted to Water Operations for their review and concurrence or denial.

G. Water Main System

1. The City of Goodyear water main system is based on a grid system with three (3) basic classifications of water lines which are determined by use. These classifications are:
 - a. Transmission - Located in arterials or collector streets water line size 16-inch and larger shall have no service connections.
 - b. Distribution - Water line sizes 6" to 14" in size located in arterial, collector or residential streets. Distribution mains are feed by transmission lines and may have service connections.

- c. Services - Water line from the distribution line to the meter, including the meter and all connections.
- 2. All development shall provide for water distribution and service lines of appropriate sizes, with normal locations as follows:
 - a. Transmission water lines
 - (1) When existing or future development requirements are such that in the opinion of the City staff a transmission water line is necessary. Then an appropriate sized transmission water line will be constructed by the developer.
 - b. Distribution water lines
 - (1) In arterial street alignments (mile alignments), 16 inch minimum diameter lines. In minor arterial street alignments (1/2 mile alignments) 12-inch minimum diameter lines.
 - (2) All other locations, 8 inch minimum diameter lines; except single family residential developments may be served with 6 inch diameter lines, provided all fire hydrants on the 6 inch lines are fed from two directions.
 - (3) These are minimum guidelines and the City may require larger sizes in unusual circumstances.
 - c. Service water lines.
 - (1) Metered taps for single-family residence shall be installed per Detail G-3310.
 - (2) For all other types of development, metered taps shall be located outside of street improvements but within the right-of-way or an easement.
 - (3) All services shall require backflow prevention based on the hazard rating.
 - d. Fire sprinkler line locations shall be such that maintenance activity will not disrupt normal access to the development. Backflow prevention is required per Detail G-3352 or G-3353. Fire Department Connection shall be painted red.

- e. Multi-unit sites shall require isolation valves (post indicator type) to isolate each unit.
- f. Post indicator valves shall be locked in the open position.
- g. ADHS Bulletin 10 shall apply to all City of Goodyear water lines.

5.1.2 Technical Design Requirements

A. Water Lines

1. Materials and Details

- a. Standard materials and details for pipe 12 in. diameter and smaller shall be per Maricopa Association of Governments, Uniform Standard Specifications and Details for Public Works construction. Materials and details for pipe larger than 12 inch diameter shall be ductile iron or city approved material.
- b. Pavement replacement type and compaction type shall be indicated on each sheet.
- c. Ductile iron pipe may be required in cases where pipelines could be subjected to heavy external loads. Most notably, these include, but are not limited to, deep pipelines and pipelines in the roadway alignment which would be exposed to heavy construction vehicle loads prior to paving.
- d. Fireline connection off of service lines (four (4) inches and larger), and all hydrant connections shall be constructed of ductile iron pipe, minimum Class 150 or equal to or greater than the supply line class.

2. Location within Right-of-way

- a. Right-of-way shall be dedicated prior to any construction.
- b. Water line location in rights-of-way shall be in accordance with Standard Detail G-3132 and G-3136.

3. Easement Requirements

- a. No water lines shall be installed in an easement unless the Public Works Director, or his designee, has approved in writing the placement of the line(s) in an easement(s) and the property owner has granted the necessary easement(s) and right(s)-of-way.
- b. If approved, water lines outside of public rights-of-way shall be placed in easements not less than twenty (20) feet wide, or at the discretion of the Public Works Director, or his designee. The water lines shall be centered in the easement and shall be accessible from a public right-of-way.
- c. Easements larger than twenty (20) feet in width may be required if other utilities are also located in the easement or if additional area is needed for maintenance equipment access due to the size and/or depth of the line(s).
- d. Easements shall be free of obstructions, shall not be located in a fenced area, and shall at all times be accessible to City service equipment such as trucks, backhoes, etc. Areas in question shall be approved in writing by the Public Works Director, or his designee.
- e. Easements shall be dedicated prior to any construction.

4. Depth

- a. Minimum cover from finish grade to the top of the pipe shall be:
 - (1) 48 inches for water lines 12 inches and larger
 - (2) 48 inches for water mains in industrial areas or in major collector and arterial streets
 - (3) 36 inches for water lines smaller than 12 inches, and all lines in secondary streets, interior streets, and other locations.
- b. The proposed depth shall be clearly noted in each plan sheet. Any changes in depth required to avoid conflicting utilities, etc., shall be noted.

B. Valves

1. Materials and Details

- a. All gate valves shall be resilient seated, solid wedge gate, shall open left, and shall conform to the City of Goodyear Specifications for Resilient Seated Gate Valves available at the Public Works Department.
- b. Butterfly valves shall not be permitted on mains less than 16 inch diameter. On larger pipe butterfly valves shall be required.
- c. Blocking will be concrete only per MAG Std. Detail 340.
- d. Per City of Goodyear standard detail #2305, valved by-pass lines are required on all valves sixteen (16) inches or larger in diameter. In important installations and for deep pipe cover, pipe entrance access manholes shall be provided so that the internal valve parts can be serviced.

2. Spacing

- a. The maximum spacing of valves in industrial/commercial and multi-family districts shall be 500 feet. In single-family residential, the maximum spacing shall be 700 feet.
- b. The desired maximum number of valves required to isolate an area is four (4). Two or three is preferred. One fire hydrant is the preferred number to be out of service, with two the maximum number. Twenty (20) homes shall be the maximum number to be without water per closure. Valves shall not be located within a driveway.
- c. Approved valve spacing and location shall be strategically placed for operation and maintenance of the system, per Public Works Department.
- d. Valving shall be provided to allow isolation of lines crossing major washes, railroads, major highways, bridges, and airports.
- e. A valve shall also be provided on each hydrant branch.
- f. Valved by-pass lines are required on all valves sixteen (16) inches or larger in diameter.

- g. In important installations and for deep pipe cover, pipe entrance access manholes shall be provided so that the internal valve parts can be serviced.
- h. All mains branching from feeder mains or loops shall be valved adjacent to the feeders so that the branch mains can be taken out of service without interrupting the supply to other locations.
- i. Any water line that will be extended in the future shall have a valve, along with a 13 foot minimum stub with cap and 2 inch corp. stop, at the end.
- j. For distribution lines 12 inch and smaller, one valve shall be placed on each side of major canals, railroads, etc.
- k. One gate valve shall be placed between each fire hydrant and the water main.

3. Operation

- a. All water valves that control the City's energized water lines shall only be operated by City personnel.
- b. City personnel will be responsible for opening and closing of all existing water valves where a contractor must tie into an existing water main stub that does not have a valve on the end.
- c. Only City personnel shall turn the water valve that lies between the new system and the existing system for the purposes of chlorinating the water lines, flushing water lines and pressure testing water lines.
- d. Only City personnel shall operate valves that control the Water System Zone Split. These valves are designated by red valve covers.
- e. All closed valves shall be designated by painting valve covers white.

C. Fittings

- a. Capped dead end lines shall be tapped with a flushing device as per MAG Standard Detail 390, Type “B”, but not less than two (2) inches in diameter. Blow-off valves, fire hydrants, or other suitable means shall be installed at the end of dead-end mains to allow periodic flushing of the lines.
 - b. Flushing devices shall not be located in washes, detention/retention areas, sidewalks, or driveways.
2. Air release valves shall be installed at all changes in slope of water transmission mains twelve (12) inches or larger in diameter, as follows:
 - a. When water line changes from a positive slope to a zero slope in primary direction of flow.
 - b. When water line changes from a positive slope to a negative slope in primary direction of flow.
 - c. When water line changes from a zero slope to a negative slope in primary direction of flow.
 - d. When vertical alignment changes to undercross or overcross another facility (i.e. utility, drainage wash, etc.) air release valves (per the above guidelines) and isolation valves shall be installed on both sides of the crossing.
3. NOTE: Slopes less than or equal to 0.002 ft/ft shall be treated as zero slopes.
4. Install a hydrant/bypass assembly as required by the Public Works Director, or his designee.
5. All air release valves shall be a combination air/vacuum release type.
6. No water line shall be deflected either vertically or horizontally, in excess of the recommended by the manufacturer of the pipe or coupling without the appropriate use of bends or offsets. Fittings may be required where more than two pipe lengths are deflected.
7. Thrusts on pipelines with unrestrained joints occur wherever a bench or branch outlet exists. If the lengths of pipe are joined by tension joints, such as welded joints in concrete pipelines,

other forms of anchorage may not be required. The determination of whether or not a given section of pipeline needs restrained joints or other means of anchorage shall be made by a qualified professional engineer and approved by the City. All thrust anchorage's shall be designed for a safety factor of not less than 1.50 under maximum pressure loading.

8. All changes in direction in water lines six (6) inches or larger in diameter shall be marked with an electronic marker. Valve locations permit adequate identification of pipeline location (typically at crosses and tees). Electronic markers shall be a self-leveling type and operate on a frequency of 145.7 Khz up to a depth of four (4) feet.

D. Water Services

1. The developer shall install all 1 inch, 1-1/2 inch and 2 inch water services in new subdivisions.
2. The developer shall install all water meter boxes per City requirements.
3. The developer is responsible for application and payment of all applicable fees.
4. Water services installed outside of public right-of-way shall be contained within a dedicated easement.
5. Water meters will not be in concrete.
6. Water service lines and meters shall not be located in parking lots, driveways, sidewalks, washes, or retention/detention areas.
7. Branch water service line tees are not allowed.
8. Construction plans must indicate location of meter service lines and sewer taps to each unit referenced with stations and dimensions from the street center line or monument line. Location of sewer service relative to the water service shall also be shown.
9. No service connections shall be made to water lines sixteen (16) inches or larger in diameter, or to water lines designed solely to transmit water from one pressure zone to another pressure zone.

10. All galvanized iron and polyethylene water service lines in sizes three-quarter (3/4) inch through two (2) inches which are exposed during construction shall be replaced in their entirety with Type "K" copper tubing. This will include the replacement of iron service saddles with bronze saddles and the replacement of both the corporation stop and the meter stop in all cases.
11. If water meter services are located incorrectly by the developer and must be moved to avoid conflicts, the City will relocate them a maximum of 10 feet. If the desired relocation is greater than 10 feet, the old service must be shut off at the main. A new service shall be installed by the City after the developer has paid fees and both services shall be noted on the "as-built" plan.
12. Existing water meters shall be relocated by the City only after the developer pays the prevailing fees.
13. The size of the meter will correspond to the size of the tap, except the minimum tap size shall be 1-inch. Extra attention is recommended when sizing services for custom home lots where meter sizes often exceed one (1) inch.
14. All meters will not be fenced in or enclosed and must be accessible at all times.

E. Water Meters

1. The water meters shall be sized and designed in accordance with the requirements of the Uniform Plumbing Code as adopted by the City.
2. The water meters shall be installed in accordance with Detail G-3312 and the MAG Std. Specifications Section 631 shall be used as an acceptable guideline.
3. Water meters 3" and larger shall be installed in accordance with the MAG Std. Detail 345-1 and 345-2.
4. The water meter to be used shall Conform to the City of Goodyear Specifications for Water Meters, available at the Public Works Department, and shall satisfy the following requirements:
 - a. Oscillating Piston - Single and multi-family residential.

- b. Compound - Generally residential, this unit is designed for use where most of the flow is low, some intermittent and no more than occasionally high.
- c. Turbo - This shall be used where a wide variety of flows can be expected but most are at the high end.
- d. Propeller - This shall be used where low flows never occur, the flows shall be consistent within a limited range.

F. Taps

- 1. A three foot minimum separation is required between service taps at the mainline.
- 2. Wet Taps - Tapping sleeves will not be installed on M.O.A. A.C.P.
 - a. The Contractor shall make all wet taps from the City's energized water system.
 - b. The developer is responsible for preparing application and payment of all applicable fees prior to taps being made.
- 3. Dry Taps
 - a. The developer shall make all dry taps for 1 inch, 1-1/2 inch, and 2 inch water service connections.

G. Cross-Connection Control Program

It shall be the responsibility of the City of Goodyear to protect the public water system from health hazards and non-health hazards by the implementation of a cross-connection control program. The program shall consist of inspection by the City of Goodyear Water Operations Division and implementation of a backflow prevention and maintenance program, as outlined in the "Manual of Cross-Connection Control" published by USC.

- 1. Inspection
 - a. Air-gap separation shall be required on premises where entry is restricted so that cross-connection inspections can not be made with sufficient frequency or at sufficiently short notice to assure the following high hazard conditions do not exist.

- (1) Public water system is used to supplement reclaimed water.
 - (2) Wastewater is pumped and/or treated.
 - (3) Reclaimed water is used.
 - (4) Hazardous substances are handled or stored.
 - (5) Irrigation systems exist into which fertilizers, herbicides or pesticides could be injected.
 - (6) Unapproved water supply exists which is interconnected with public water system.
 - (7) Deemed necessary by ADEQ or City of Goodyear Water Operations Division.
- b. Reduced pressure principle (RP) backflow prevention device shall be required on premises where entry is not restricted so that cross-connection inspection can be made with sufficient frequency or at sufficiently short notice, where the following high hazards may exist and an air-gap has not been deemed necessary by ADEQ or the City Water Operations Division.
- (1) Service 2-1/2 inches and larger.
 - (2) Wastewater is pumped and/or treated.
 - (3) Reclaimed water is used.
 - (4) Hazardous substances are handled or stored.
 - (5) Unapproved water supply exists which is not interconnected with public water system.
 - (6) Potential for system modification.
 - (7) Repeated history of cross-connections being established or re-established.
- c. Double Check Valve Assembly (DC) backflow prevention device shall be required on premises where entry is not restricted so that a cross-connection inspection may be conducted with sufficient frequency or at sufficiently short notice, where the following, but not limited to, non-health hazards may exist and an air gap or RP assembly has not been deemed necessary by ADEQ, or the Water Operations Division.
- (1) Back siphonage or back pressure situation
 - (2) Non-Health hazardous materials are being stored or handled

- d. Pressure Vacuum Breakers (PVB) or Spill-Resistant Vacuum Breakers (SVP) shall be required when entry is not restricted, so that a cross-connection inspection can be made with sufficient frequency, or at sufficiently short notice, where the following, but not limited to, non-health hazard, or health hazards may exist under a back siphonage condition, and an air gap, RP or DC has not been deemed necessary by ADEQ, or the Water Operations Division.
 - (1) Landscape irrigation that is only subject to back siphonage
 - (2) Internal protection (point source)
- e. Double Check Detector Assembly (DCDA) shall be deemed necessary on all non-residential fire sprinkler systems where the City's potable water supply is used. A residential system shall be considered those systems found in residential dwellings consisting of approved potable water piping and materials. A DCDA shall be required on all Class I, II, III and IV fire protection systems.
- f. Reduced Pressure Principle-Detector Assemblies (RPDA) shall be deemed necessary on all Class V and VI fire sprinkler systems. A RPDA shall also be deemed necessary when any hazardous or non-hazardous solutions are added to the fire sprinkler systems, or used as part of the fire protection system.
- g. A list of approved backflow assemblies is available from the Water Operations Division of the Public Works Department. (932-1637)

2. Implementation

The consumer, at own expense, shall install, operate and maintain the approved backflow prevention device(s) as required by the City of Goodyear.

- a. Installation of approved backflow prevention devices shall be as follows:
 - (1) An Air-Gap separation shall be located as close as practical to the user's connection at the meter. The piping between the user's connection at the meter and the receiving tank shall be entirely visible unless approved in writing by the Water

Operations Division. The air-gap separation shall be at least twice the diameter of the supply pipe, measured vertically from the flood rim of the receiving vessel to the supply pipe. In no case shall this separation be less than one inch.

- (2) A Reduced Pressure Principle backflow prevention device shall be installed as close as practical to the users meter. The device shall be installed a minimum of 12 inches above grade and not more than 36 inches above grade with 12 inch clearance on both sides, and in a manner where it is accessible for testing.
 - (3) A Double Check backflow prevention device shall be installed as close as practical to the users meter. The device shall be installed a minimum of 12 inches above grade and not more than 36 inches above grade with 12 inch clearance on both sides, and in a manner where it is accessible for testing.
 - (4) A Pressure Vacuum Breaker or Spill-Resistant Vacuum Breaker backflow prevention device shall be installed as close as practical to the point source or user meter. The device shall be installed a minimum of 12 inches above all downstream piping and use of valve(s). This distance shall be measured from the bottom of the assembly. Assembly shall be installed where it is accessible for testing.
 - (5) A Double Check Detector Assembly and Reduced Pressure Principle Detector Check Assembly backflow prevention device shall be installed as close as practical to the property line. The device shall be installed a minimum of 12 inches above grade and not more than 36 inches above grade, with a 12 inch clearance on both sides, and in a manner where it is accessible for testing.
- b. Maintenance of backflow prevention devices shall be as follows:
- (1) Maintenance of backflow prevention devices shall be tested immediately after installation,

relocation, or repair. Devices shall not be placed in service unless they are functioning as required. Devices shall be tested annually or more frequently if determined to be necessary. When devices are found to be defective they shall be repaired or replaced. Backflow prevention devices shall be tested by persons certified as a General Tester or specialist by USC or ASSET. Accurate records of these tests shall be maintained by the City for a minimum of five years. Copies of these records shall be submitted to City of Goodyear Water Operations Division.

H. Fire Department Connections (FDCs) shall be installed as follows:

1. FDCs shall be located and arranged so that hose can be readily attached without obstructions.
2. Height shall be a minimum of 18 inches to the bottom and a maximum of 48 inches to the top of the connections. See Detail G-3330.
3. FDCs shall face onto access, be unobstructed, and be installed on the customer side of the water supply check valve.
4. FDCs shall be painted red.

I. Pressure Requirements

Pressure extremes in water systems result in potential for contamination to enter the network. Low pressures in the water system may allow polluted fluids to be forced into the system. High pressures may cause ruptures or breaks in some elements of the network.

1. The normal working pressure in the distribution system should not exceed one hundred (100) psi.
2. Domestic systems shall be designed to maintain a minimum residual pressure of forty (40) psi at the highest ground level to be served under all flow conditions. (Minimum pressure for fire protection may differ. See Fire Flow Requirements in this section.)

3. All water mains and service lines shall be designed for a minimum normal internal working pressure of one hundred-fifty (150) psi plus appropriate allowances for water hammer.
4. Water hammer may produce momentary pressures greatly in excess of normal static pressures, thus increasing the probability of water main failure.
 - a. Suitable provisions shall be made to protect the system from water hammer pressures.
 - b. The occurrence and severity of water hammer can be reduced through the use of slow-closing valves, pressure-release valves, surge tanks, variable frequency drives, soft start motor controllers, and air chambers.
5. In cases where greater than the above noted maximum pressures are required for effective operation, all elements of the system shall be designed accordingly. Pressure information for existing water lines may be obtained by having a flow test performed on the existing system. These tests may be performed by a private fire protection company who must certify the results of the tests and submit them to the City for approval.
6. A Right-of-Way Permit issued by the Community Development (932-3494) is necessary to perform the test and the City shall be notified a minimum of forty-eight (48) hours before the test by contacting the Public Works Department.

J. Design Flows

1. Design flows for transmission mains shall be based on the current City Master Policy to provide for the water system's ultimate demands. Calculation of the flows for the specified development will be calculated to ensure that existing supply is sufficient to meet proposed development. All improvements necessary to meet proposed flows to include pumping stations, reservoirs, lines, and appurtenances are to be a part of the design.
2. Peak flow calculations on transmission mains shall be based on fireflow figures in accordance with the City of Goodyear Fire Code. See Table 5-1 for average day demand flows.
3. Design flows for all distribution systems shall be based upon existing flows and pressures as documented by the engineer.

The engineer must have a flow test performed by a private company who will certify the results in writing to the City. These flows will be used by the engineer for the design and design report for all water line projects Fire Protection Requirements.

K. System Layout

1. Water must be maintained in the City Rights-of-way. Hydrants, meters, blowoffs, and valves shall not be located in washes, detention/retention areas, driveways, or sidewalks.
2. All new water mains shall be designed in a looped configuration whenever feasible to provide maximum circulation.
3. Long, straight reaches of transmission mains shall be marked every 440 feet with an electronic marker. Installation of an electronic marker may be omitted when valve locations permit identification of pipeline location.

L. Pipe Cover and Separations

1. All mains twelve (12) inches or larger in diameter shall have a minimum cover of forty-eight (48) inches over the top of the pipe and shall be marked with locating tape. Water mains in industrial areas or in major collector and arterial streets shall have a minimum cover of forty-eight (48) inches over the top of the pipe. In other locations, mains smaller than twelve (12) inches in diameter shall have a minimum cover of thirty-six (36) inches over the top of the pipe.
2. Cover for water mains shall be measured from existing or proposed finished grade of pavement or natural ground, whichever measurement is greater and results in adequate pipe protection during construction.
3. Caution should be taken in design and construction to protect all water supplies from wastewater contamination.
4. When PVC or ACP water lines twelve (12) inches and smaller are exposed during construction and the bedding is disturbed, the water line shall be changed out to ductile iron pipe (minimum Class 150) with mechanical joints or flanged joints.
5. Where conditions prevent adequate horizontal and vertical separation, both the water line and sewer line should be

constructed of ductile iron pipe (minimum Class 150) with mechanical joints or flanged joints.

6. Separation of water and electrical or gas lines shall conform to City of Goodyear Detail G-3300.

M. Culvert Crossings

1. The minimum clearance under culverts and storm drains shall be two (2) feet.
2. Valves shall be installed on both sides of each crossing in a manner which will minimize service disruption should the crossing need to be isolated for maintenance or repair. See Detail G-3301.
3. Lines shall not be deflected, or swept, but shall be installed in accordance with the City of Goodyear Detail G-3301.
4. Air valves shall also be installed at all culvert crossings as per Fittings Section in this manual.

N. Sampling Stations

1. The City of Goodyear requires sampling stations to be located in all new developments. The sampling stations are to be located within the right-of-way and constructed Detail G-3370. A sampling station will be required for every three hundred (300) dwelling units or less. A large development constructed in phases will be required to install the sampling point on the first phase and each subsequent phase when the dwelling units for all phases constructed exceed 300 units.

O. Fire Flow Requirements

1. Water distribution facilities shall be sized to deliver a minimum fire flow of:
 - a. one thousand five hundred (1,500) gallons per minute (gpm) to commercial, industrial, and multi-family residential properties.
 - b. one thousand (1,000) gallons per minute (gpm) to one and two-family dwelling unit residential properties.
 - c. These fire flows are based on the requirements of the City of Goodyear Fire Code for approved automatic sprinkler systems.

2. Fire Hydrants

a. Materials and Details

- (1) Fire hydrants shall conform to the City of Goodyear Specifications. Approved Fire Hydrant list is available at the Public Works Department.
- (2) Fire hydrants shall be installed per Detail G-3330.
- (3) The developer shall tap all energized mains after the developer places the tapping sleeve and valve. The installation must be approved by Field Engineering prior to tapping.
- (4) The developer shall provide the fire hydrant, other necessary materials, and all labor for installation.

b. Spacing

- (1) The spacing of fire hydrants is to be measured along the street or roadway in which a fire hose would be laid. Generally, this spacing is measured along the curb line.
- (2) Fire hydrants shall be located outside of street improvements but within the right-of-way or easement. General spacing for fire hydrants shall be:
 - ◆ 400 feet maximum in a single-family residential development.
 - ◆ 300 feet maximum in a multi-family residential development.
 - ◆ 350 feet maximum in a high rise, storage, or industrial complex.
 - ◆ Fire hydrants shall not be installed on any portion of a dead-end line which is more than 400 feet from its source of supply (water line which is looped)

- ◆ Within 150 feet of the backflow prevention device with the fire department connection from the nearest hydrant.
- ◆ Fire hydrant spacing shall be maintained along required Fire Department access roads.
- ◆ Fire hydrant shall be a minimum distance of 40 feet from structures.
- ◆ 1,000 feet maximum for unloaded traffic corridors. (Roadways with no adjacent development).

c. Locations

- (1) Fire hydrants at intersections shall be placed 2 feet back of the sidewalk and 4 feet from the curb return within the radius. Fire hydrants in mid-block shall be placed in line with side property extension, 2 feet back of the sidewalk. Care shall be taken to minimize conflicts with future driveways.
- (2) Location of the fire hydrant shall be such that the pipe leading to the hydrant will be under the least amount of pavement.
- (3) On private property, the fire hydrant shall be accessible along a Fire Department access road.
- (4) A 3 foot minimum clearance shall be maintained around the fire hydrant per Detail G-3331. The hydrant shall be set 2 feet behind back of curb to the face of the fire hydrant.
- (5) A finished grade elevation shall be shown for the “break-away” flange (traffic model type) on each fire hydrant. The minimum allowable distance between the centerline of the lowest hose outlet shall not be less than 18 inches above grade. See Detail G-3330.

- d. **Retro-Reflective Pavement Marker Requirements**
Blue retro-reflective pavement markers shall be used as a method of identifying fire hydrant locations. Retro-reflective pavement markers shall be 911A-blue, Fire Lite, Amerace Corporation, Signal Products Division or equal.

Blue marker installations shall conform to the following required marker installation locations:

- (1) Two-Way Streets or Roads - Markers should be placed 6 inches from edge of painted centerline on the side nearest the fire hydrant. If the street has no centerline, the marker should be placed 6 inches from the approximate center of the roadway on the side nearest the hydrant.
- (2) Streets with Left Turn Lane at Intersection - Markers should be placed 6 inches from edge of painted white channelizing line on the side nearest the hydrant.
- (3) Streets with Continuous Two-Way Turn Lane - Markers should be placed 6 inches from the edge of the painted yellow barrier line on the side nearest the fire hydrant.
- (4) Street with Raised Medians - Marker should be placed 6-inches from lip of gutter on the side nearest the fire hydrant, and on the top of median curb on the side opposite the fire hydrant.
- (5) Freeways and Expressways - Because of higher maintenance at these locations if placed on the roadway, markers should be placed on shoulder 1 foot to the right of the painted edgeline opposite the off-right-of-way fire hydrant location.
- (6) Private drives in apartments, condos, etc., are same as item (1) above.

3. Fire Lines

- a. Location of on-site fire lines and taps should be determined by the site relationship of the fire

department connection, riser location, emergency access, and fire hydrant locations. Size of fire lines shall be determined by City design criteria and flow test data provided by the engineer for the design of the project. Fire systems must include a back flow prevention device.

- b. Plans shall be based on a flow test as per Fire Flow Requirements section of this manual. The drawings shall be of uniform size (24-inch by 36-inch) and shall be drawn to scale. One set of the approved civil water plans shall accompany this submittal. Applicable City of Goodyear and N.F.P.A. 24 construction notes shall also be included on the working drawings.
- c. Installation will be per approved working plans. Any deviation from approved plans will require written permission of the authority having jurisdiction.
- d. Inspections will be per N.F.P.A. 24 and as may be required by the Goodyear Fire Department and the Public Works Department.

P. Auxiliary Storage Tanks

- 1. Pressures and discharge flows required by Goodyear Fire Department will be for a minimum of two (2) hours for commercial projects, and may require a fire pump package installation when the building's construction type, occupancy fire load commodities' classification, volumetric building areas, building height and individual square footage areas per floor level produce a pressurized fire flow demand in excess of the water transmission main's capabilities.
- 2. For residential storage requirements see City ordinance requirements.

5.1.3 Zone Split

A. General

- 1. The City's water distribution system may be divided upon City approval into various zones. Each zone operates as an independent water distribution system, and cross connections between zones are prohibited.

B. Valving

1. At selected locations between the zones special valves have been installed. Operation of these valves shall be by City personnel only.
 - a. Special Requirements for Developments Bordering Zone Splits
 2. In those situations wherein a proposed development borders on the zone split boundary, the developer shall install a redundant main on the development side of the zone split boundary in order to insure that the subject development has a closed loop distribution system.
 3. A redundant parallel main shall be required to close the loop within the development and shall be extended as necessary to connect to other distribution mains within the zone.
- C. All plans for water distribution mains adjacent to these zone split boundaries shall be reviewed and approved by the City.

5.1.4 Booster Pump Station Design Standards

- A. Pumps shall be vertical turbine type with all motors equipped with a solid shaft. Pumps shall be fitted with a mechanical seal and discharge piping from each pump must have a flexible coupling to control vibration.
- B. All check valves shall be silent closing type.
- C. Mercoid type pressure switches shall be used where applicable.
- D. All control sensors shall be isolated from the system with shut-offs.
- E. Three-phase 480 volt power shall be used where available.
- F. Field prints shall include all electrical information.
- G. Phase protection shall be provided for all three-phase motors and pumps.
- H. Pump failure indicator lights shall be included on the control panel.
- I. All pump station control panels shall be designed for the future installation of a telemetry system.
- J. An hour meter shall be provided for each pump.
- K. Air conditioning shall be provided for all VFD control panels

- L. Pumping stations shall be equipped with water meters which register and totalize in US gallons.
- M. Pump control, pressure relief, pressure reducing, and/or pressure sustaining valves shall have position indicators.
- N. A properly designed air relief valve shall be mounted on top of all hydro-pneumatic tanks. Air relief valves shall be a minimum of two (2) inches. Hydro-pneumatic tanks shall be fitted with an isolation valve.
- O. Area lights are to be wall-mounted with at least one operated by an electric eye.
- P. All pump station sites shall be secured by a six (6) foot block wall with a minimum of two (2) access points. Access shall be provided by two gates - one shall be three (3) feet wide for walk through access; the other shall be twelve (12) feet wide for vehicular access.
- Q. Underground pump stations shall include the following:
 - 1. All underground pump stations shall be air conditioned. The air conditioning system shall be an air-cooled split system with the evaporator installed in the pump vault and the condenser located separately above ground. Careful consideration shall be given to proper air circulation and maintenance operations.
 - 2. The vault shall be equipped with an automatic drainage system. Drainage system controls shall be located outside of vault and secured.
 - 3. Vault shall have and alarm light and audible signal system to signal flooding of vault.
 - 4. Human access doors shall be 2'-6" x 2'-6". Equipment access doors shall be 3'-0" x 3'-0". Access doors shall be equipped with torsion assisted hinges capable of providing the equivalent of a twenty (20) pound lift.
- R. A minimum of three (3) sets of operations and maintenance manuals shall be prepared and provided to the Water Operations Division prior to the final inspection.
- S. NOTE: It is recommended that designers coordinate their pump station design with the Water Operations Division and the City Engineer prior to final plan preparation (see Section 5.1.1.F.3 of this manual).

5.1.5 Plan Preparation

- A. Plans shall be prepared per the guidelines in Construction Plans Preparation - Chapter 2.

Average Day Water Demand Per Dwelling Unit in GPD[†]

Land Use	Inside Use	Outside Use	Total Use
Residential <2 DU per acre	208.90	276.70	485.60
Residential 2 - 3.99 DU per acre	193.70	276.70	470.50
Residential 3 - 7.00 DU per acre	175.90	72.30	248.20
Residential 8 - 11.0 DU per acre	155.30	72.30	227.60
Residential 12 - 22 DU per acre	155.30	72.30	227.60
Resort Hotel (per room)	401.70	44.60	446.40
Resort Hotel Low Intensity (per room)	401.70	35.70	437.40
Commercial (per square foot)	0.75	0.11	0.90 ^{††}
Cultural/Institutional (per acre)	669.50	669.50	1339.10
Office (per square foot)	0.50	0.075	0.60 ^{††}
Industrial (per acre)	873.10	154.40	1027.50
Utility (per acre)	0.00	1785.40	1785.40
Open Natural (per acre)	0.00	0.00	0.00
Open Developed (per acre)	0.00	1785.40	1785.40
Open Golf (per acre)	0.00	4285.00	4285.00

[†]City of Scottsdale Water Supply - Distribution Mast Plan, June 1987, Prepared by NBS/Lowry Engineers & Planners.

^{††}City of Phoenix Memorandum Water Demand and Wastewater Flow Generation Rates, April 1985.

TABLE 5-1
Average Day Water Demand Per Dwelling Unit in GPD

6.1 SEWER SYSTEM DESIGN

6.1.1 General Comments

This section provides guidance and minimum design criteria for the modification and construction of wastewater collection and treatment systems constructed within City of Goodyear public right-of way or easements. It is intended for general use in the planning, design, and plan preparation processes.

6.1.2 General Information

A. Ordinance Requirements

1. The City requires sewer lines to be installed along the entire length of property line frontage of the property to be developed whenever future extension of the line is possible. The property line frontage is that portion of the property along a public right-of-way. If a parcel to be developed has more than one property line frontage, the City will require a sewer line to be installed along all frontages.
2. Upon development of property for which City water or sewer service is available, the developer shall submit a plan for the sewer system prepared by a professional engineer licensed in the State of Arizona.
3. The developer shall install, at his expense, all on-site and off-site improvements necessary to serve his development. This includes payment of all required development fees.
4. The City may require users who have a non-residential discharge to monitor their discharges and obtain an Industrial Waste Discharge Permit.
5. For more specific information on ordinance requirements, review of the Goodyear Revised Code is recommended.

B. City Policies

1. Sanitary sewers shall be designed to serve the ultimate population density expected in the tributary area. The design must be in conformance with the current City-approved Wastewater Master Plan; and, as such, shall take future connections into consideration.
2. Sewer lines shall not be privately owned if future connection to said sewer lines will be necessary to serve adjacent parcels.

3. Private sewer lines shall meet Maricopa County Health Department and City of Goodyear Building Inspection requirement for approval. Privately owned and maintained sewer lines shall not be located within the street right-of-way or a Public Utility Easement (PUE). On-site sewer collection systems within commercial shopping centers shall be designed as private systems.
4. Private Sewer Companies
 - a. Portions of Goodyear's municipal service area are provided sewer service by private sewer companies. Private companies are those defined by Arizona Revised Statutes.
 - b. Modifications or construction of sewage collection systems within private sewer company franchise areas shall be reviewed by the City and the subject company. The City of Goodyear shall review private sewer systems within the City limits to City of Goodyear current standards. The applicable review fees shall be paid and a note placed on the drawings delineating operation and maintenance responsibilities. The City cannot provide sewer service within private sewer company franchise areas.
5. EPA Regulation

The City is required by the USEPA to develop and implement a program to control discharges that might harm the Publicly Owned Treatment Works (POTW). The program establishes local discharge limits for non-residential users and provides for a permitting process based on the users discharges and type of business. Details of the program and requirements are found in the Goodyear Revised Code. Specific information may be obtained by calling the Wastewater Operations Division at 932-1637.

C. Sewerage System

1. All developments are required to connect to the City's sewerage system. On-site disposal systems are not allowed. Exceptions are made only with the written approval of the City Engineer.

2. The City's sewerage system includes six (6) classifications of sewer lines which are determined by use. These classifications are:
 - a. Building Sewer - In plumbing, the extension from the building drain to the public sewer or other place of disposal; also called house connection.
 - b. Branch Sewer - A sewer that receives wastewater from a relatively small area and discharges into a main sewer serving more than one branch sewer area.
 - c. Lateral Sewer - A sewer that discharges into a branch or other sewer and has no other common sewer tributary to it.
 - d. Submain Sewer - A sewer which the wastewater from two or more lateral sewers is discharged and which subsequently discharges into a main, a trunk, or other collector.
 - e. Main Sewer/Trunk Sewer - In larger systems, the principal sewer to which branch sewers and submains are tributary. In small systems, a sewer to which one or more branch sewers are tributary. In plumbing, the public sewer to which the house or building sewer is connected.
 - f. Interceptor Sewer - A sewer that receives flow from a number of transverse sewers or outlets, and conducts such waste waters to a point for treatment or disposal.
3. All developments shall provide for trunk, collector, and service lines as required to provide sewer service for not only the individual development but for the ultimate service area, as deemed necessary by the City Engineer.
4. Sewer lines shall be sized to accommodate their ultimate service area. The minimum size line for the public mains is 8 inch diameter.
5. Public sewage lift stations shall not be permitted in the City of Goodyear. Under unusual circumstances when a lift station is the only means of the property being sewered, consideration shall be given by the Public Works Director, or his designee, on a case by case basis.

6. A sewerage feasibility report, prepared by a registered civil engineer, shall be required to determine that the current line has the capacity for connection and that the minimum slopes will allow for the installation of services. The cost of said report shall be the responsibility of the developer.
7. All sewers shall be a minimum of 8 inch diameter. Larger mains may be required dependent upon the maximum flows anticipated with full development of the ultimate service area. The following data may be used as a general guide for planning purposes. Additional engineering studies may be required in individual cases to verify validity of these general capacities:
 - a. A maximum of 120 acres of combined commercial and residential property may drain into any 8 inch line.
 - b. A maximum of 250 acres of combined commercial and residential property may drain into any 10 inch line.
 - c. A maximum of one square mile may drain into a 12-inch line with the written approval of the City Engineer.
8. ADHS Bulletin 11 shall apply to all City sewer lines.

6.1.3 Technical Design Requirements

A. Sewer Lines

1. Materials and Details

In selecting pipe material for sewers, consideration shall be given to the chemical characteristics of the wastewater, especially in industrial waste flow areas, the possibility of septicity, exclusion of infiltration, external and internal pressures, abrasion and similar problems encountered with the established grades.

 - a. Standard materials and details for collector and service lines, over 15 inch, within the rights-of-way, shall be of vitrified clay pipe (V.C.P.). Materials and details for trunk sewer mains of 24 inch diameter or larger will be considered individually. Plastic pipe, 8-inch through 15-inch is allowed for installation within the right-of-way.
 - b. No public sewers other than service taps shall be less than eight (8) inches in diameter unless permission is received in writing from the Engineering Department.

- c. Pipe material shall not change between manholes.
- d. Where standard strength pipe is not structurally sufficient, or when proper cover cannot be maintained, additional strength must be obtained by using extra-strength pipe, special bedding specifications, or special construction methods.
- e. All types of pipe materials used in design shall have established ASTM, ANSI, or NSF standards of manufacture or seals of approval and shall be designated for use as sewer pipe.
- f. Pavement replacement type and compaction type shall be indicated per MAG Standard Details and Specification on each sheet.

2. Hydraulic Design

- a. Slopes shall be sufficient to maintain velocity of 2 feet per second in the sewer, based upon Manning's Formula, using an "n" value of 0.013. To prevent abrasion and erosion of the pipe material, the maximum velocity shall not exceed 9 feet per second.
- b. Hydrogen sulfide problems continue to be a concern, and therefore must be analyzed in the Design Report and be provided for in the design of the system where required.
- c. All velocities should be analyzed under peak flow conditions.
- d. The following table indicates the minimum slopes generally considered necessary to obtain minimum 2 feet per second. Exceptions require the written approval of the City Engineer. In no case shall velocities greater than 9 fps be allowed.

TABLE

Minimum Slopes for Sanitary Sewers
(n = 0.013)

Size	Minimum Design Slopes
4 in. Building Conn.	0.0200 ft. per ft.
6 in. Building Conn.	0.0100 ft. per ft.
8 in. Building Conn.	0.0034 ft. per ft.
10 in. Building Conn.	0.0024 ft. per ft.
12 in. Building Conn.	0.0020 ft. per ft.
15 in. Building Conn.	0.0016 ft. per ft.
18 in. Building Conn.	0.0012 ft. per ft.

3. Location within the right-of-way
 - a. All public sanitary sewer lines shall be located within the dedicated street right-of way.
 - b. Sewer lines shall be located per Details G-3132 and G-3136, as applicable.
 - c. All sewers shall be aligned parallel to the property lines or the street centerlines, or as close to parallel as possible.
 - d. Minimum horizontal distance from the sewer line to another underground utility shall be 6 feet.
4. Easement Requirements
 - a. No sewer lines shall be installed in an easement unless the Public Works Department has approved in writing the placement of the line(s) in an easement(s) and the property owner has granted the necessary easement(s) and right(s)-of-way.
 - b. If approved, sewer lines outside of public rights-of-way shall be placed in easements not less than twenty (20) feet wide, or at the discretion of the Public Works Director, or his designee. The sewer lines shall be accessible from a public right-of-way.

- c. Easements larger than twenty (20) feet in width may be required if other utilities are also located in the easement or if additional area is needed for maintenance equipment access due to the size and/or depth of the line(s). Easements shall be free of obstructions, shall not be located in a fenced area, and shall at all times be accessible to City service equipment such as trucks, backhoes, etc. Areas in question shall be approved in writing by the Public Works Department.
 - d. Easements shall be dedicated prior to any construction.
- 5. Pipe Locations and Separations
 - a. Separation of Water and Sewer Lines
 - (1) Caution should be taken in the design and construction of sewer lines to protect all water supplies from wastewater contamination. To minimize the potential of contamination, the engineer shall design the horizontal and vertical separation of water and sewer lines in accordance with MAG.
 - b. Separation from Gas Lines
 - (1) The minimum horizontal distance from a sewer line to a gas line shall be six (6) feet wall to wall.
 - c. Separation from Storm Drains and Culverts
 - (1) Sewer lines crossing less than two (2) feet below a storm drain or culvert, or under large structures such as box culverts and bridges may require additional protection such as the use of ductile iron pipe.
 - (2) Sewers crossing over storm drains and culverts must be a minimum of one (1) foot above.
- 6. Cover and Depth
 - a. All laterals shall have a minimum four (4) foot cover measured from finished ground at the property line or easement line. In no case shall sewer lines be installed

with less than four (4) feet of cover over the top of the pipe.

- b. All trunks, mains, or branches shall have a sufficient depth to serve the ultimate drainage area with a minimum cover of 6 feet.
- c. When a sewer line crosses an irrigation ditch, at least 4-foot cover between the flow line of the ditch and the crown of the sewer shall be maintained. If this condition cannot be met, the crossing shall be made according to the directions of the City. Permits shall be acquired in the name of the City.
- d. Where cover is less than 3 feet (due to topography such as canals, washes, etc.) a 6 inch thick concrete cap shall be constructed in place over the sewer line. This cap shall extend not less than 2 feet on either side of the outside of the barrel of the sewer pipe and shall extend 5 feet beyond the limits of the canal, wash, etc. This is allowed only with the written approval of the City Engineer.
- e. Sewers shall be installed at a depth sufficient to ensure gravity drainage of wastes from each service. Sewer design shall ensure adequate drainage from the ultimate drainage area, and shall allow for the future extension of service to adjacent parcels.
- f. All sewers shall be designed to absorb superimposed live loads and backfill overburden without damage to the pipe material, and without adversely affecting the hydraulic characteristics of the pipe. The engineer shall specify minimum depths of cover to be provided during the construction of roadways or other facilities affecting cover over the sewer line.

7. Intersecting Lines

- a. When the size of pipe changes, the crowns shall match.
- b. Manholes with the through line having a change of direction of more than 30 degrees shall have a minimum 0.10 foot drop through the manhole.
- c. Manholes with a line intersecting the through line: the intersection line invert shall be 0.10 foot above the flow

line of the through line. The lines shall intersect at no more than a 90-degree angle.

8. Curved Sewers

- a. Horizontal curvilinear sewers will not be accepted.

9. Tie-in to Existing System

- a. Construction plans shall call for contractor to tie-in new work to the existing, active system only after completion of the new work and specific approval of the engineering inspector to make the tie-in.

10. Design Flows

- a. In the absence of flow data provided by the designer, new domestic sewage systems shall be designed in accordance with the following:
 - (1) Sewers eight (8) to twelve (12) inches in diameter shall be designed with peak capacities, when flowing full, of not less than four hundred (400) gallons per capita per day (gpcd).
 - (2) Sewer mains larger than twelve (12) inches in diameter shall be designed using one hundred five (105) gpcd and a peaking factor developed from "Harmon's Formula":
 - ◆ $Q_{max} = Q_{avg} [1 + 14/(4+P^{1/2})]$
 - ◆ WHERE: $P = \text{Population}/1,000$
 - ◆ Commercial flows should be based upon known regional data, or accepted engineering reference sources, approved by the City.
 - ◆ Density data to be used in sewer design*:
 - Single family units
2.5 persons/unit

- Multi-family units:
 - * Townhouse/patio homes
2.9 persons/unit
 - * Apartment
2.5 persons/unit

◆ *Subject to regional variations as approved by the City's planning program.

B. Manholes

1. Materials and Details

- a. All manholes shall be per MAG Standard Details and Specifications.
- b. If the manhole is more than ten (10) feet deep, or the line is over twelve (12) inches in diameter, the manhole shall be five (5) feet in diameter. Ladders with cast-in Plastic/fiberglass anchors will be an acceptable alternative to steps.
- c. The flow channel through the manhole shall be steel-trowel finished to conform in shape and slope to that of the sewers. The manhole shelf shall be brush or broom finished, with a slope of one inch per foot. The manhole bottom should be filleted to prevent solid depositions and channeled to ensure satisfactory flow to the lower invert.
- d. Manholes should be protected from storm drainage and flooding conditions whenever possible. Sewers will not be allowed in washes or drainage areas unless otherwise approved in writing by the City's Wastewater Operations Division. When designs specify manholes to be located in washes or drainage areas, bolted water-tight manhole covers or water-tight manhole inserts shall be used to prevent inflow. The manhole shall be a monolithically poured structure designed such that infiltration or exfiltration cannot occur. Providing for the elimination of infiltration and/or exfiltration in washes is the engineer's responsibility in the design of the system.

2. Spacing

- a. Manholes are required at all changes in grade, pipe size, all changes in alignment, and to ensure the sewer line does not cross the street centerline. The horizontal angle formed between the two lines shall not be less than ninety (90) degrees in the direction of flow.
- b. Maximum manhole spacing shall be:
 - (1) 400 feet for 8 inch to 15 inch sewers
 - (2) 500 feet for 18 inch to 60 inch sewers
 - (3) 500 feet for sewers over 60 inch.
- c. Manholes in City streets must be located near the center of a traffic lane, rather than on or near the line separating traffic lanes. Manholes should not be located in bike trails, equestrian trails, sidewalks, or crosswalks.
- d. A clean out or manhole shall be placed on the upstream end of lines if the line will not be extended. The spacing to a cleanout from the last manhole shall not exceed 150 feet. Cleanouts must be placed on the end of all line extensions to allow for cleaning and televising of lines.
- e. If there are services between the last manhole and the end of the line, a cleanout shall be required on the end of a line that may be extended in the future. If there are no services between the last manhole and the end of the line, then the end of the line shall be plugged and an additional plug shall be placed in the upstream side of the last manhole.
- f. Manholes on boundaries of the subdivision or improvement district shall have stubs with shaped inverts in appropriate directions for future connections.
- g. Centerline Station and offset shall be shown on all manholes.

3. Intersecting Lines Within Manholes
 - a. Manholes with lines intersecting at angles more than 30 degrees shall have a minimum 0.10 foot drop across the manhole.
 - b. When sewer lines of differing sizes enter the same manhole, the upstream pipe shall not have its crown lower than the crown of the downstream pipe.
 - c. In large trunk lines, invert at junctions should be designed to maintain the energy gradient across the junction and prevent backflow.
4. Drop Manholes
 - a. If the difference in invert elevations between inflow and outflow sewers exceeds twelve (12) inches, a drop connection shall be installed in accordance with MAG standards, Type A, Detail No. 426. The manhole bottom shall be filleted to prevent solids deposition.
5. Monitoring Manholes
 - a. The City shall determine whether or not a sewer will be required to have a monitoring manhole to test the flow and composition of their sewage. As a general rule, sewer uses with a projected water consumption of 25,000 gallons per day or a discharge of a categorical industrial nature or as otherwise required by the City's Wastewater Operations Division, shall be required to have a monitoring manhole.
 - b. On sewer lines with diameters smaller than six (6) inches, monitoring manholes shall be standard MAG manhole with a straight channel and no taps or bends for two (2) pipe lengths upstream and one (1) pipe length downstream.
 - c. Design details for monitoring manholes on sewer lines six (6) inches or larger or with a peak flow greater than forty (40) gpm shall be approved by the City.
 - d. Monitoring manholes shall be located in a twenty (20) foot PUE which extends from the manhole to the existing public sewer. The monitoring manhole shall

be accessible at all times for monitoring crews and vehicles.

C. Taps

1. Materials and Details

- a. New sewer taps shall be per MAG Standard Details 440 and 441.
- b. The maximum number of taps into manholes shall be three (3) into a manhole in a cul-de-sac and two (2) into a manhole in all other situations. However, no tap is allowed into a manhole against incoming flow through the manhole. Sewer service line inverts shall be a maximum of one and one-half (1.5) feet above the crown of the outflow pipe.
- c. A 3 foot minimum separation between service taps is required.
- d. All taps shall be dimensioned and stationed using the closest downstream manhole as Station 0 + 00. Typical dimensions to water service lines shall be shown.
- e. Taps installed for future connection shall be marked.
- f. All taps, when installed, must be perpendicular to the lateral. Taps may be at an angle only if located into a manhole, but the flow line of the sewer service line shall not be more than four (4) inches below the crown of the line to be tapped.
- g. No taps will be made directly into sewers larger than 15 inch. Such taps must be into a manhole.
- h. Plans shall be reviewed by the design engineer for backflow prevention valves which are required where finish floor elevations are below both upstream and downstream manhole rim elevations.
- i. Grease, oil, or sand interceptors which are acceptable to the City shall be provided for laundries, restaurants, automobile service facilities, and other facilities when, in the opinion of the City, they are necessary for the proper handling of liquid wastes. Interceptors shall be supplied and maintained by the owner.

2. Sizes

- a. Tap sizes for single family residential developments shall be 4 inch. A 4-inch diameter tap shall be provided for each platted lot.
- b. Commercial lots with buildings shall have 6 inch minimum taps and provide service adequate for discharge. Commercial lots without buildings shall have no taps unless requested by owners, then only 6-inch minimum taps or larger shall be allowed.
- c. Multi-family developments shall have a minimum 6-inch tap.
- d. All taps larger than 6 inch require the installation of a manhole.

3. Location

- a. Taps shall be located so as to avoid conflicts with driveway locations.
- b. Proposed tap locations shall be shown on all plans and shall be changed in the field by the City only.
- c. Because water lines are located behind the curb in many locations, conflicts with sewer service lines are possible. Sewer line should be designed to allow sewer service lines to pass under water mains behind the curb with twelve (12) inches of clearance to minimize potential health hazards.
- d. When it is not possible to maintain sufficient clearance, or the sewer service will pass over the water main, the sewer service must be encased in concrete of six (6) inches minimum thickness, three (3) feet from each side of the crossing, or ductile iron pipe must be used for the same distance.

6.1.4 Sewage Pump Stations

A. Site Selection

1. In selecting a site for a sewage for a sewage pumping facility consideration should be given to:
 - a. Accessibility
 - b. Drainage Characteristics
 - c. Visual Impact
 - d. Function and Design Constraints
2. The potential for flooding should be considered when selecting a pump station location. The station's equipment shall be protected from damage and remain operable during a 100-year flood.

B. Pump Station Design

1. Sewage pump station requirements are provided by the Arizona Department of Environmental Quality (ADEQ) and are published in their Engineering Bulletin No. 11. Additional requirements specific to the City of Goodyear can be obtained from Water Operations before beginning design. At a minimum, telemetry, dual pumps, generator, three phase power, and odor control will be required.
2. It is recommended that prior to the preparation of construction drawings that a preliminary or basis of design report be prepared and submitted to the City for acceptance. The preliminary report should outline the type of equipment and controls proposed for the station. A final design report prepared by a registered professional engineer licensed in the State of Arizona must accompany all pump station design drawings.

C. Sewer Lift Station Design Standards

1. There shall be a minimum of 2 pumps at each site. Pumps shall be capable of passing 2-1/2" solids and equipped with stainless steel motor shafts.
2. Check valves shall be silent closing type and located in a separate vault.
3. Three-phase 480 Volt power shall be used where available.

4. Field prints shall include all electrical information.
5. Phase protection shall be provided for all three-phase motors and pumps.
6. An hour meter shall be provided for each pump.
7. Pump failure indicator lights shall be provided on the control panel and the exterior of the station.
8. An access hatch and permanent ladder shall be installed in the wet well.
9. All pump station control panels shall be designed for future installation of a telemetry system.
10. Only submersible pumps shall be used.
11. Approved submersible pump stations shall be on the approved list at Public Works.
12. A minimum of three (3) sets of the operation and maintenance manuals shall be prepared and provided to the Water Operations Division prior to the final inspection.
13. Force main shall be identified as such with magnetic tape one (1) foot above the pipe.
14. Clean outs shall be installed per section 6.1.4.D.4.
15. Lift station shall be located a minimum distance of one hundred (100) feet from the nearest home. A block wall shall be constructed around the perimeter of the lift station site.
16. Odor control measures must be identified in the design concept report and incorporation into the design.
17. Provide spare parts as recommended by the manufacturers.
18. Electrical specifications information is to be provided on field prints as follows:
 - a. Electrical specifications
 - b. Size of conduits
 - c. Size and type of conduits
 - d. Size and type of over-current protection for all disconnects

- e. Phase protection for all three- phase motors and pumps
- f. Floats shall be used for all controls and alarms.
- g. Failure indicator lights on control panel
- h. Hour meter totalizer for each pump
- i. Flashing light to warn of pump failure
- j. Alarm circuitry to one terminal board for telemetry
- k. No electrical connections in wet well
- l. NOTE: It is recommended that designers coordinate their pump station design with the Water Resources Department prior to final plan preparation (See Section 5.1.1.F.3 of this manual.)

D. Force Mains

- 1. Velocity Requirements
The velocity of flow in the force main shall be between 4 and 6 fps.
- 2. Materials of Construction
All types of pipe materials used in design of force mains shall have established ASTM, ANSI, AWWA, and NSF standards of manufacture or seals of approval and shall be designated as pressure sewer pipe. Force mains shall be identified as such with marking tape one foot above the pipe.
- 3. Air Release Valves
Air release valves designed for sewage shall be provided on force mains at all peaks in elevation. See Detail G-3440.
- 4. Cleanouts
Two-way cleanouts shall be provided every eight hundred (800) feet or one-way cleanouts every four-hundred (400) feet.
- 5. Water Line Separation
 - a. Where a force main crosses a water main or transmission line, the force main shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the water line.
 - b. For details regarding force main discharge into a manhole, refer to Detail G-3442.

6. The minimum separation between force mains and water lines shall be two (2) feet wall-to-wall vertically and six (6) feet horizontally.

7. Testing

a. Prior to issuance of a Certificate to Operate, all force mains shall be pressure tested. Preparatory to testing, the section of the pipeline to be tested shall be filled with water and placed under a slight pressure for at least forty-eight (48) hours. The pipeline shall then be brought up to fifty (50) psi over or to one hundred twenty-five (125) percent of working class pressure, whichever is greater, and shall be maintained on the section under test for a period of not less than four (4) hours.

b. Accurate means shall be provided for measuring quantity of water required to maintain full test pressure on the line for the test period, which shall not exceed:

(1)
$$L = [JD \sqrt{(Pt)}] / 4500$$

(2) Where:

- ◆ L = Maximum allowable leakage in gallons per hour for the section of pipeline tested
- ◆ J = number of joints in length tested
- ◆ D = diameter of pipe in inches
- ◆ Pt = test pressure in psi

6.1.5 Wastewater Treatment

A. Treatment Plants

The subject of wastewater treatment plant design is beyond the scope of this design booklet. The engineer is urged to contact the Maricopa County Environmental Services Department, and the City of Goodyear Wastewater Operations Division for further information pertaining to the development of wastewater treatment facilities within Goodyear.

B. Septic Systems

1. When sewer service is not available, a temporary septic system may be allowed with the approval of both the City of Goodyear and the Maricopa County Environmental Services Department.
2. A “dry” sewer line shall be installed along the entire length of the property line frontage. The property line frontage is that portion of the property along a public right-of-way. If a parcel to be developed has more than one property line frontage, the City will require a sewer line to be installed along all frontages.
3. The operation and maintenance of septic systems are the responsibility of the owner. The City of Goodyear will not accept any septic system for operation and maintenance.

C. Reclaimed Water

Wastewater Reclamation and Advanced Treatment

The City’s current Wastewater Master Plan calls for the development of regional wastewater reclamation facilities. Reclaimed water is to be used to satisfy the demand for water to irrigate golf courses and parks. Reclaimed water in excess of the irrigation demand shall be provided advanced treatment and stored underground for subsequent recovery. Contact the City’s Wastewater Operations Division for more detailed information on this plan.

6.1.6 Plan Preparation

A. General

1. Plans shall be prepared per the guidelines in Chapter 2 - Construction Plan Requirements.
2. Notes which apply to construction on the City of Goodyear’s sewer system are required on each set of improvement plans which include work on the City’s sewer system or a sewer system which is to be dedicated to the City. These notes are provided in Section 2.1 of this manual.

B. Plan Requirements

1. The following paragraphs highlight improvement plan requirements pertaining to the preparation of sewer improvement plans which are to be submitted to the City for approval.

- a. Sewer line stationing shall be along the center line of the pipe.
- b. Concrete encasement shall be shown in both plan and profile. The beginning and ending stations of the encasement shall be called out.
- c. If a line is to be connected to an existing system, the following note shall be placed on the plans:
“Contractor shall verify the location of the existing sewer line before proceeding with trenching.”
- d. Both slope and elevation shall be shown on all proposed sewer main stubs (profile not required).
- e. Where sewer lines cross water lines, storm drains, or drainage culverts, the relationship shall be shown in both plan and profile and minimum separations shall be called out.
- f. For permitting purposes, quantities for all items of work within public rights-of-way and public easements shall be included on the cover sheet of the plans.
- g. Sewer service line invert elevations shall be called out for all plans showing sewer service line construction.
- h. The drawings shall show all utility locations, sizes, easements, rights-of-way, and other structural features of the sewer for current and future building construction.
- i. Lift station details shall show all invert elevations, structural elevations, existing and finished grades, control setting elevations, structural design of wet wells and dry wells, valves and piping, surge control devices, pump suction and discharge details, and any other details which will provide a clear understanding of the design.
- j. Plans and profiles of force mains shall show size, invert and grade elevations, materials of construction, utility location, and any other details which define the force main construction requirements.

- k. Private sewer lines shall be noted as such on plans. The responsibility for operation and maintenance should also be called out.
- l. Easements of record shall be noted and shown in plan view including docket and page numbers or recorder's number.
- m. All plan documents for sewers and/or wastewater treatment works shall be prepared by a registered professional engineer licensed in the State of Arizona under the provisions of ARS 32:141-145.
- n. There are additional requirements for the preparation of improvement plans in the City of Goodyear. The additional requirements are presented in Section 2.1 of the City of Goodyear Design Standards and Policies Manual.

C. Design Reports

- 1. A design report shall be required. The design report serves to present necessary information concerning design assumptions and computation.
- 2. The objective of the report is to provide background information for review of the project. All proposed lift station designs shall be accompanied by a signed and sealed design report.
- 3. Record Drawings
Record drawings are required for all sewer system improvements. Upon approval of the improvement plans, the developer shall provide the City of Goodyear with As-Builts.

D. Reviews and Approvals

- 1. All improvement plans which include work within the City of Goodyear shall be submitted for review and approval by City staff. Plan review submittals are made to the Planning and Community Development Department. Plan review fees must be paid at the time of plan submittal.
- 2. Maricopa County Environmental Services Department approval is required prior to City approval. No permits for public sewer installation will be issued until the owner/developer has provided the necessary easements and

rights-of way. The instruments of dedication must be approved by the City of Goodyear and recorded at the Maricopa County Recorder's Office.

E. Master Plans

1. When required, a Master Wastewater Plan and report shall be prepared in accordance with the City's Design Standards and Policies by a registered professional engineer who is licensed to practice in the State of Arizona. The master plan and report shall address, but not be limited to, the following:
 - a. The Master Plan will become the basis for a Water and Wastewater Service Agreement between the developer and the City of Goodyear when such agreement is required by the City. This agreement will specify terms and requirements for water and wastewater service to the development. The introduction to the report should state this.
 - b. All development projects shall be responsible for determining their specific wastewater system needs. Service for proposed developments shall not be provided at the expense of existing customers and the wastewater master plans shall verify this.
 - c. Adequate sewer capacity must be shown for the development. In addition, sewer system calculations or a sewer model shall be used to determine the required on-site and off-site facilities such as sewer lines, lift stations, and force mains necessary to serve the project.
 - (1) If no change in zoning is proposed, then the wastewater system for the project must be analyzed to the point of discharge to an existing sewer which has sufficient capacity to serve the project and which is included in the current City Wastewater Master Plan.
 - (2) If the proposed development requires a change in zoning which increases density or proposes a sewer different from the City's existing Wastewater Master Plan.
 - (3) Calculations should be based on Manning's equations using a Manning's "n" of 0.013 and

the invert elevation and pipe diameters of all existing and proposed pipes.

- (4) Waste water flows generated within the development shall be calculated as specified in Section 6.1.3.A.10 - Design Flows.
 - (5) Off-site calculations shall be based on a sewer sub-basin which shall be shown on an accompanying map. The sub-basin shall include all areas upstream of the development and downstream of the development to the next interceptor sewer. An interceptor sewer shall be defined as 15-inch diameter or larger.
 - (6) Off-site wastewater flows shall be as specified in the City's current Wastewater Master Plan.
 - (7) A computer disk containing all calculations shall be submitted along with the master plan report. Common spread sheet formats compatible with Lotus 1-2-3 are acceptable.
- d. Compliance with the current City Wastewater Master Plan for the respective area.
- e. Each Master Plan must include a map showing the following:
- (1) All proposed on-site and off-site facilities; including, but not limited to, interceptors, sewer lift stations, and force mains.
 - (2) Proposed street locations, parcel boundaries, and proposed lots within each parcel.
 - (3) Contour lines at two (2) foot intervals showing the elevation of the land surface. If drainage requirements will require extensive grading, then finish grade should be shown. Sufficient information must be provided to evaluate pipe cover.
 - (4) A separate area location map shall be provided showing existing and proposed streets, as well as existing parcels surrounding the project to a distance of not less than one (1) mile from the

exterior boundaries of the project. Assessor's maps can provide the information required to prepare these composite maps.

- (5) The scale of all maps must be sufficient to show all required information clearly
- f. All sewer lines which cross golf courses or other open areas shall do so within established roads. If dedicated roads are not practical, then crossing must be within an easement twenty (20) foot wide, or at the discretion of the Public Works Director, or his designee. All other sewer lines outside dedicated rights-of-way shall be on easements not less than twenty (20) feet wide, or at the discretion of the Public Works Director, or his designee. No walls shall cross these easements.
- g. The Wastewater Master Plans must show compliance with the Goodyear Revised Code to construct pipelines, if not already in place, across all dedicated frontages of the development. If the slope of the existing ground is such that other properties fronting the sewer would benefit, then this condition shall be justified in the report.
- h. A construction schedule shall be included in table format for all wastewater related construction required to serve the development, per signed zoning or other agreements.

7.1 MEDIAN LANDSCAPING

7.1.1 Purpose

- A. This section describes the City's Median Design Standards. It is intended to acquaint designers and developers with these standards; as well to assist them in processing plans through the plan review process in an efficient and timely manner.

7.1.2 Median Character

- A. There are four character areas with differing median design standards for each area. These are general designations. Contact the City of Goodyear's Community Development office at 932-3494 to determine which character area designation to use for each specific project.
- B. Medians within Commercial Cores as identified in the General Plan will be allowed a higher percentage of plant coverage with the plant materials for the character area in which they are located.
 - 1. Downtown and Urban Character
 - a. Balance the use of plant material with decorative paving (stamped concrete, exposed aggregate, pavers, etc.), to minimize the exposure of decomposed granite.
 - 2. Suburban Character
 - a. Use decomposed granite, exposed aggregate, and grouted riprap in place of decorative paving.
 - b. Plant palette should begin to incorporate more arid-type materials.
 - 3. Transitional Arid Character
 - a. Handset riprap and decomposed granite are to be the primary inorganic materials.
 - b. Plant palette shall consist of indigenous and desert-compatible materials.

4. Natural Character

- a. Native stone and indigenous decomposed granite are to be the primary inorganic materials
- b. Plant palette is to consist of indigenous material only, and shall conform to the native distribution patterns, densities, and maturity.

7.1.3 Landscape Guidelines

A. Maintenance Responsibility

1. Maintenance of landscape medians will be the responsibility of the developer, property owner, or a homeowners association for a given period of time (usually 2 years). This period of responsibility will begin and end following inspections and acceptance of installation by a representative of the City. It is the developer's responsibility to set up the inspections by calling the Public Works Department at 932-1637.
2. The particulars for maintenance responsibility of medians are to be stated on the final landscape plans submittal, the final plat, and/or in a separate agreement with the City.

B. Median Widths

1. More detailed information is contained in the City of Goodyear Design Standards and Policies Manual, Section 4.1 Geometrics.
2. Median width is measured from back of median curb to back of median curb. The minimum width for a median is 3 feet. If the median is landscaped, a 4 foot minimum is generally required.

C. Ends of a Median

1. The first ten (10) feet and the last ten (10) feet of a median are to be decorative concrete (stamped concrete, exposed aggregate, etc. - be creative).

D. Placement of Trees and Shrubs

1. For planting details of trees, shrubs, and groundcovers.
2. Trees shall be located a minimum of five (5) feet from the back of median curb. Mature canopy size shall also be considered and may require a greater setback.

E. Tree Quantities and Sizes

1. Trees shall be provided at the rate of one tree per each twenty-five (25) lineal feet of median length. The minimum size is 15 gallon with fifty (50) percent to be provided as mature trees or larger.

F. Grading

1. Mounding should not be used in the area designated as Downtown or as Urban Character.
2. The maximum slope of any mounding shall be 4:1 (25%).
3. The finished grade shall be smooth, uniform, and a minimum of four (4) inches below the top of curb.

G. Decomposed Granite

1. Size is to be Madison Gold three-fourths (3/4) inch minus.
2. A sample shall be submitted to the City's Public Works Department for approval prior to the contractor ordering and bringing onto the site.
3. Color to match what exists in the area. If none exists in the area contact a representative of the City's Community Development Department at 932-3494 to determine an acceptable color.

H. Boulders

1. One-third of any boulder is to be set in ground.
2. Maximum vertical exposure is eighteen (18) inches above grade.

I. Plant Selection

1. All plant materials used in a median are required to come from the Arizona Department of Water Resources low water use plant list for the Phoenix Active Management Area. The selected plant materials are also to be consistent with the appropriate character areas described in Section 7.1.2 of this manual.

7.1.4 Irrigation Guidelines

A. Workmanship and Materials

1. All materials and workmanship shall conform to the requirements and recommendations of the Irrigation Association Standards. All material specifications shall be based on ASTM standards. All work standards shall be in compliance with ANSI.

B. Approved Irrigation System Types

1. Drip system using rigid lateral.
2. Bubbler system using pressure-compensating bubblers. (Use only with written approval from the City of Goodyear Public Works Department).

C. Controllers

1. Ambient light or Rainbird RCM-B (or approved equivalent) controllers are to be used. Contact a representative of the City's Public Works Department at 932-1637 for any substitution.
2. A security cabinet is to be provided for each controller.
3. Controllers are to be grounded. Show details on final irrigation plans.
4. Controllers are to be placed in the center of the median a minimum of twenty (20) feet before the beginning of the turn bay.

D. Power Source

1. Contractor is responsible for initiating account and service connection.

2. Power source is to be located within the median or the right-of-way, or a utility easement must be provided. This location is to be indicated and noted on the final irrigation plans.
3. A power cut-off switch is to be provided to each controller.
4. All wiring (110 and 24 volt) is to be sleeved under pavement, sidewalks, etc.

E. Water Source

1. Water source and location of proposed tap is to be shown on final irrigation plans.
2. Contact COG Water and Wastewater at 932-1637 for information on tapping into City waterlines.
3. The minimum source pressure required to operate the system shall be noted on plans.

F. Remote Control Electric Valves

1. Valves are to be of brass construction minimum size one (1) inch.
2. Approved valve is Rainbird series G.
3. Ball valves shall be installed in front of all control valves.
4. All direct buried control valve wiring shall be a minimum 14 gauge.

G. Back Flow Prevention Devices

1. Only reduced pressure assemblies will be used.
2. Acceptable back flow prevention devices are Febco 825-Y or Watts 909 assemblies with ball valve shut off.
3. All back flow prevention devices shall have a security enclosure.
4. Union to be installed on back flow assembly.
5. Brass wire strainer shall be installed on back flow assembly.

6. Back flow prevention devices must be tested by a certified tester before the City accepts responsibility for maintenance of the system. Contact 932-1637 for a list of approved certified testers.
- H. Approved Ball Valves
1. Ball valves shall be manufactured by Febco or Watts. Approved equivalents may be substituted. Contact a representative of the City's Public Works Department at 932-1637 for substitute approval.
- I. Approved Emitters
1. Bow Smith "SL" and "ML 200" series or approved equivalent (for trees only).
- J. Approved Bubblers
1. Rainbird pressure compensating bubblers or approved equivalent.
- K. Approved Pressure Regulators
1. Senninger preset pressure regulators or approved equivalent.
- L. Pipe
1. All pipe shall be minimum Class 200 PVC.
 2. All main lines, sleeves, and fittings shall be minimum Schedule 40 PVC.
 3. Copper, or brass shall be used between water meter and backflow prevention device.
 4. All risers shall be flexible vinyl PVC pipe.
 5. Compression couplings shall not be allowed on main lines.
- M. General Irrigation Design Criteria
1. Main lines are to have a minimum backfill cover of eighteen (18) inches.
 2. Lateral lines are to have a minimum backfill cover of twelve (12) inches.

3. Schedule 40 sleeving under roadways are to have a minimum horizontal separation of four (4) inches and a minimum backfill cover of twenty-four (24) inches.
4. Piping located in the same trench are to have a minimum horizontal separation of four (4) inches.
5. The irrigation system is to be located entirely within the median.
6. Valve boxes are to have a six (6) inch minimum pea gravel sump.
7. All solvent welded PVC pipe and joints are to be primed with pipe primer. The type of glue and primer shall be per the pipe manufacturer's recommendations or directions.
8. Back fill material is to be free of rocks, boulders, and any other extraneous matter and debris.
9. Contractor is responsible for initiating account and having water meter set.
10. Trees and shrubs shall be valved separately.
11. The entire irrigation system must be independent of other user, i.e. landscape dedicated to the City of Goodyear for maintenance is to have separate power and water meters from other irrigation systems.
12. All back fill material for trenches shall be free of rock and debris.
13. Plans shall indicate existing and design operating water pressure requirements.
14. Final submittal for irrigation plans shall show details for controller valves, pressure regulator, backflow prevention device, valve boxes, enclosures, flush caps, trenching, backfill, security cabinet, emitters, and/or bubblers.

7.1.5 Sight Distance

A. Sight Distances and Safety Triangle

1. To determine sight distances, use the criteria set forth in Section 4.1, Geometrics.

2. The sight line safety triangle shall be clearly indicated and delineated on the final landscape plan submittal.
- B. Planting within the sightline safety triangle
1. Shrubs planted within the safety triangle are to have a mature height of not more than three (3) feet. Height shall be from edge of pavement, and total height shall include the height of any mounding.
 2. Trees planted within the safety triangle are to have a clear trunk pruned to a height of seven (7) feet or greater upon installation. Height shall be from edge of pavement, and total height shall include the height of any mounding.

7.1.6 Alterations and As-Built

- A. If field conditions require relocation of water meter, backflow prevention device, controller, valve, or any other major component of the irrigation system as shown on approved plans contact a representative of the City's Public Works Department at 932-1637 prior to any installation. The City will respond within 24 hours.
- B. Contractor is to provide an accurate set of as-built mylar drawings to the Landscape Inspector prior to initial acceptance of a system.

7.1.7 Non Conformance

- A. Designs which do not conform to the criteria set forth in this publication may be appealed in writing to the Community Development Department. The approval, with or without conditions, or denial by the Development Policy Committee of an application shall be final unless within twenty (20) days from the date of the board's decision the applicant shall appeal therefrom in writing to the City Council. Such appeal shall be submitted through the City Clerk and shall indicate where, in the opinion of the appellant, the Board was in error. The City Clerk shall schedule the appeal for a City Council agenda, and the City Council at its meeting, shall uphold, modify, or overrule the decision of the Board. The decision of the City Council shall be final.

7.1.8 List of Recommended Plants

See City of Goodyear MAG Supplemental Details G-3600-1 through G-3600-3 for City approved plants and minimum tree sizes.

7.3 NON-PAVED TRAILS

7.3.1 Definitions

A. Trail

A trail can be defined in many ways, by many different people. For the purposes of this document, a trail shall be defined as a route or path which has been prepared or designated for recreational functions. This manual presents guidelines applicable to foot, horse and bicycle trail usage that can occur on an unpaved trail surface. Trails are not simply avenues to get from one place to another; they offer user opportunities to participate in numerous recreational activities. Providing quality recreational opportunities while protecting the resource is a major trail management concern and challenge. The information in this manual should be used as a guideline. Each trail needs its own plan of operation.

B. Urban Trail

Urban trails are those which occur in areas of urban or suburban densities, or where improvement of the trail surface is necessitated by the nature of the development within which it occurs.

C. Rural Trail

Rural trails are those which occur in natural washes or other natural areas, and require little improvement of the trail surface.

D. History of Use Corridor

These trails are those which have been established by historical use, however are not currently protected by right-of-way or some like method to preserve the use.

E. Supplemental Trails/Urban Easements

Additional trails which provide access to the main trail network. These may also include existing equestrian easements. These are normally provided and maintained by the adjoining landowners.

7.3.2 Location Standards

A. Urban Trails

These trails are being developed in response to one or two emerging trends. One of these trends is the increased leisure time and interest in fitness-oriented activities among urban groups. The other trend comes from the increasing concerns about the quality of the environment due to the explosive urban growth our cities are facing. Urban trails provide readily available recreation and aesthetic amenities by enhancing natural or man-made open spaces. These trails also can provide for possible routes for non-

motorized circulation throughout the urban network giving a more pleasurable alternative to those who desire it. These trails should be located along streets with low volume speed traffic and minimal frontage; along other streets which have wide clear setbacks; or along open-space corridors.

- B. Supplemental Trails
Additional trails shall be required in areas where development would block access to the main trail system.
- C. Underpasses/Overpasses
Grade separated crossings shall be provided for crossing major streets where the crossing does not occur at a signalized intersection and there is no safe alternative.
- D. Bridges
These should be used to cross major barriers such as the Roosevelt Irrigation Canal. Site design and landscaping shall provide for the maximum possible retention of native plant materials on the site.

7.3.3 Trail Nodes

- A. Hiking Support Site
Facilities include year-round shade and water. Vehicular parking not to exceed four spaces is optional.
- B. Equestrian Support Site
Facilities include water for people and horses, hitching posts, year-round shade, two to five parking spaces for trailers and up to four spaces for regular parking.
- C. Major Trail Head Site
Facilities include a corral, rest rooms, water for people and horses, year-round shade, five to eight trailer parking spaces and eight to twelve other parking spaces.
- D. Design
All facilities shall be compatible with adjacent development.

7.3.4 Trail Design

A. Urban Trails

1. Minimum Clearances

- a. Minimum right-of-way or easement for trails - 15 feet
- b. Minimum width of clear trail surface - 8 feet
- c. Vertical clearance from surface - 10 feet
- d. Lateral clearance from edge of trail three feet above surface - 3 feet
- e. Distance from back of curb to edge of trail
 - (1) Along expressways - 25 feet
 - (2) Along arterials - 15 feet
 - (3) Along major collectors - 9 feet
 - (4) Elsewhere - maximum feasible

2. Sight Distance

- a. As a trail approaches within 100 feet of a street intersection, the maximum height of landscaping and wall between the trail and the curb shall be four feet.
- b. Trail facilities shall not infringe upon typical sight distance.

3. Alignment

- a. Except in areas of steep grades, trail alignments should not weave excessively or abruptly.
- b. Grade changes should not be abrupt.
- c. Where alignment changes are necessarily abrupt or tight, additional clear trail surface should be provided.
- d. Maximum grade shall be 12 percent. For short distances this grade may be able to be increased with approval from the City.

- e. Clear trail surfaces shall flare to 14 feet wide within 24 feet of signalized intersection crossings.

4. Drainage

- a. Trails should not occur within detention or retention basins. (Exceptions must have Development Review staff approval).
- b. Grading and surface treatments adjacent to the trail should not allow impounding of water or excessive erosion of soil material onto the path.
- c. Where trail grades are greater than or equal to six percent, water bars shall be provided at 100-foot intervals in order to control erosion of the trail.
- d. When a trail occurs in a developed drainageway, nuisance water bars shall be provided at 100-foot intervals in order to control erosion of the trail.
- e. Where drainage structures or culverts block trails in drainageway, bypass routes are to be provided around the obstruction.

5. Trail Surface

- a. Native soil to be used whenever possible.
- b. Decomposed granite or gravel can be used, if compacted and maximum size of pebbles is 3/8 inch.
- c. Where concrete surfacing is required (bridges, underpasses, crossings, etc.), only rough finished (broom) or other approved texturing will be accepted.
- d. Stable earth, chopped branches and leaves or other finely ground organic materials may be used on the trail if they are worked into the top two to four inches of soil under the trail.

6. Trail Construction

- a. Provide one-half-inch crown on graded slopes of less than three percent grade.

- b. Provide two-to three-inch out-slope on steeper graded trails.
- c. Stake the trail alignment until ALL adjacent development and construction is completed.

7. Safety Barriers

- a. Application criteria - Structural safety barriers or suitably dense landscaping shall be required on the street side of trails which are:
 - (1) Closer to the roadway than the suggested design criteria by the City
 - (2) If the trail shares an underpass or overpass with a roadway
 - (3) Where the trail is elevated above an adjacent roadway and the side slope is steeper than 6:1.
 - (4) These railings are to be compatible with neighborhood development and/or topography.
- b. Minimum Height:
 - (1) 4.5 feet, if structural
 - (2) 5 feet, if landscaping
- c. Design - The materials and character of such barriers shall be compatible with adjacent development and landscaping. Suggested types include split-rail, and corral.

B. Rural Trails

- 1. Minimum clearances
 - a. Minimum right-of-way or easement for trails not in street or scenic corridor right of way - 15 feet.
 - b. Minimum width of cleared trail surface - 8 feet
 - c. Vertical clearance from surface - 10 feet

- d. Distance from back of curb to edge of trail - maximum feasible
 - 2. Alignment - trail should follow the contours of the natural topography whenever reasonable.
 - 3. Drainage
 - a. Erosion control measures are to be provided wherever the trail grades exceed 12 percent. Logs, railroad ties, and hand-set boulders may be used.
 - b. Where roadways obstruct trails in washes, bypass routes are to be provided.
 - 4. Trails surface - native soil; larger rocks to be moved to side of trail tread.
 - 5. Trail construction - trail improvement is to be generally limited to brush clearing and branch trimming and signage.
 - 6. If trail follows a roadway, locate trail as far as possible from roadway.
- C. Underpasses/Undercrossings
- 1. Dimensions
 - a. Minimum trail width - 12 feet
 - b. Minimum height above trail surface at four feet from trail centerline - 8 feet
 - c. Minimum height above surface within three feet of trail centerline - 10 feet
 - 2. Lighting
 - a. Light wells shall be provided at the median location on arterials and expressways. Such well shall be covered by a grate, flush with the top of the median curb, with a maximum gap opening of one inch. See Detail G-3690.

3. Drainage

- a. The underpass design shall not allow nuisance water to stand on the path. If water does not drain from the underpass by gravity flow, a system must be provided to pump water from the underpass.
- b. The design of the approaches shall preclude the erosion of local soil or vegetation material into the underpass.

4. Surface

- a. Trail surface shall be sand, compacted decomposed granite, or brushed concrete. Nuisance water shall not be allowed to stand on the surface.

D. Overpasses/Bridges

1. Dimensions

- a. Minimum width - 8 feet
- b. Minimum railing height:
 - (1) 10 feet on structures over streets, canals or washes
 - (2) 4.5 feet elsewhere

2. Alignment

- a. Helical approaches are not allowed.
- b. Extend approach railings a minimum of 12 feet from the end of the structure.
- c. Maximum grade on ramped approaches is 12%.
- d. Extend approach railing to beginning of ramp.
- e. Flare approach railing except where no room is available next to roadways.
- f. Any bank slopes at the approaches shall be protected to avoid excessive erosion.

3. Drainage
The design shall not allow nuisance water to stand on the trail.
4. Construction
 - a. Use a solid concrete barrier base between the trail and the roadway when the trail bridge is built as an integral part of a roadway bridge.
 - b. If the trail surface grade on an overpass or bridge is less than 2 %, drains shall be provided to avoid ponding on the trail surface. The drain shall be covered by a non-skid grate which is flush with the surface of the trail.
 - c. The overpass type of cross section on railing shall be used wherever the trail crosses over a street or canal or is built as part of a street bridge.
 - d. The trail surface on a structure using the overpass type of cross section shall be broom-finished concrete. Creosote treated wood is also acceptable on structures using the bridge type cross section if the maximum trail grade on the structure is less than 6%.

7.3.5 Signage

A. Locations

1. Trail crossing sign - fifty feet from street crossings
2. Trail markers - at trail intersections
3. Trail markers - At abrupt or major changes in trail direction
4. Trail markers - at intervals no less than 1000 feet, if that frequency is appropriate. Effort should be made to only use signs when required for safe trail use and to guide along the trail.
5. Trail markers - at trail access points/trail heads.

B. Siting

1. On wall side of trail when wall is on one side only.

2. Staggered on both sides elsewhere.

C. Posts and Signs

1. Post burial depth: 2.5 feet
2. Installed height 2.5 feet or 8.0 feet
3. Materials (Note: other material can be approved by the City Public Works Department)
 - a. Three-inch diameter metal tubing or pipe
 - b. Four-inch diameter treated wood posts
 - c. 0.080 gauge aluminum sign blanks
4. Construction
 - a. Lettering, markings, and border on trail markers is white, background is dark green.
 - b. Trail crossing signs standard highway type warning sign.
 - c. When signage is to be located within nine feet of back of curb, install to a height of 8 feet.
 - d. Typical trail markers are installed to a height of 2.5 feet.
 - e. Smaller signage may be used on rural trails or as approved by the City Public Works Department.

7.3.6 Trail Access Gates

A. Trail Access Gates

1. These gates are to discourage motor vehicle access to trails except as required under City Ordinance. They should be located at trail heads, where trails cross major roads, and at other points where vehicles are likely to try to access a trail. These structures should be made of heavy gauge metal, concrete, native rock, or other durable and maintenance-free materials.

7.3.7 Restricted Landscaping

- A. Some plants are potentially harmful if located along trails, although no clear history of this is verified. However, in order to avoid any concerns, it is the intent of these guidelines to suggest that the following plants should be located at least eight feet from the edge of the cleared or designated trail tread. In natural areas this shall not be construed to encourage the removal of native plants. (Additional plants may be added to the list by City Staff).
1. Oleander (all varieties)
 2. New Mexico Locust
 3. Mountain Laurel
 4. Sugar Sumac
 5. Yuccas (all varieties)
 6. Century Plants (all varieties)
 7. Teddy Bear and Chain-Fruit Cholla
 8. Prickly Pear Cacti

7.5 PARK FACILITIES

7.5.1 Introduction

- A. The Park Facilities portion of the Design Standards and Policies have been established to assure that Goodyear's Park and Recreation facilities provide quality and safe experiences for its citizens. These standards and policies are not intended to provide specific design criteria, but to serve as a guide during the design phase. The design review of each park will be done on an individual basis.

7.5.2 Definitions

- A. Neighborhood Park: Provides primary park services and facilities which are easily accessible and available to local residents. Not intended for large group use. Typically between ten (10) and twenty (20) acres and serving from one block up to an entire neighborhood. Neighborhood parks are preferably located adjacent to elementary schools, neighborhood center, or within a 15 minute walking distance of households in the service area.
- B. Community Park: Provides a full range of centralized recreational activities for major portions of the City with capabilities of accommodating large group reservations. Generally feature a community center building designed to meet multi-generational recreation needs. Typically between twenty and 80 acres, serving several neighborhoods or approximately 10,000 to 25,000 people. Community parks are preferably located in the center of several neighborhood, adjacent to a middle school or high school where possible.
- C. Specialty and Regional Park: Provides specialized facilities and preserves significant unique features of the community, including environmentally sensitive areas. The size of these parks will vary as well as the specific number of people served by these parks; however, the parks should be oriented to serve the entire community and beyond. Location of park will vary depending on the dynamics of the park (e.g. park theme or mountain park.).

7.5.3 Park Master Plan Development Process

- A. A Master Plan is developed for each park to help guide the planning of facilities in each park.
 - 1. Master Plan Approval Process Steps
 - a. Planning Consultant/Parks and Recreation Team
 - (1) Prepare alternative development concepts
 - (2) Conduct public input meetings with neighborhood and community
 - (3) Develop Preliminary Master Development Plan for presentation
 - b. Public Works Department
Conduct Public Hearing to review and recommend on Preliminary Park Master Plan
 - c. Planning Consultant/Parks and Recreation Team
Prepares Final Park Master Plan from Development Policy Committee review
 - d. Public Works Department
 - (1) Reviews and recommends to Development Policy Committee and the City Council for approval of the Final Park Master Plan
 - e. Planning Commission
Reviews and recommends to City Council for approval of the recommended Final Park Master Plan
 - f. City Council
Review and approval of Final Park Master Plan
 - g. Approved Park Master Plan
End of formal public review and involvement

7.5.4 Park Design

A. Development Review

Park design must be approved by the Development Policy Committee before any development occurs on the park site.

B. Park Development

1. Park land ratio shall consist of open space (25%), passive space (25%) and facility space (50%).
2. Whenever possible, parks shall be located adjacent to school sites to create a fluid joint use between the park and school facilities.
3. Sidewalks
 - a. Designated multi-use paths shall be a minimum of ten (10) feet in width. See Sections 4.4 and 7.3 of this manual for bike paths and multi-use paths.
 - b. Sidewalks utilized specifically for pedestrians shall be a minimum of eight (8) feet in width.
 - c. All multi-use paths shall be located a safe distance away from active courts or fields.
4. Playgrounds
 - a. Playgrounds shall contain some type of shading, either from ramadas (16 ft x 16 ft minimum) and/or non-deciduous trees (30 inch boxes minimum).
 - b. Sand shall consist of a doubled washed premium bunker sand, at a minimum depth of twelve (12) inches.
 - c. Playground shall meet or exceed all current U.S. Consumer Products Safety Commission (CPSC), American Disability Act (A.D.A.) and ASTM standards.

5. Softball/Baseball Fields

- a. All fields shall be lighted to meet all current Illuminating Engineering Society (I.E.S.) standards and utilize effective shielding systems to reduce spill light off play areas.
- b. Infields shall be constructed with an approved non-toxic organic binder, red color mix material especially prepared for ballfields. Material shall be a minimum of four (4) inches in compacted depth. Bind by crushed aggregate screenings down to 1/4" or 3/8" fine particles.
- c. Homeplate and mounds shall be filled with a minimum of two (2) inches of fine gray brick clay incorporated at a uniform rate with established infield red mix. Infields and outfield turf areas shall consist of a Tif Hybrid Bermuda Grass.

6. Court Facilities

- a. All courts facilities shall be lighted to meet all current Illuminating Engineering Society (I.E.S.) Standards.
- b. Sand Volleyball courts shall consist of Double Washed Mortar Premium Grade at a depth of twelve (12) inches.

7. Irrigation

- a. Systems shall be capable of interfacing with the Calsense computerized central system.
- b. Irrigation guidelines, except as noted below, shall comply with Section 7.1.4, Median Landscaping, of this Manual.
 - (1) Irrigation pipe 2" in diameter or larger shall be Class 200
 - (2) All gate valves shall comply with valve standard set by City.

- (3) All irrigation boxes shall be set at grade and supported by blocks to prevent crushing by traffic.

8. Landscaping

- a. Plant material shall consist of low water use, drought tolerant species. Plant material shall be approved by the Public Works Department prior to installation.

9. Construction Material

- a. Park fixtures and ramadas shall consist of steel, metal, aluminum or recycled material or approved equal; wood will not be permitted.
- b. Headers consisting of concrete, brick, ultraviolet treated vinyl shall be installed between turf and landscaped areas.
- c. All drinking fountains installed in parks will be chilled and meet all A.D.A. standards.

10. Signage

- a. The standard park sign will be located at the main entrance of every neighborhood and community park. The mold shall be pre-cast with the park name engraved into the mold. The park sign mold can be obtained from the City of Goodyear Public Works Department.
- b. Specialty parks may deviate from standard park signage with the approval from the Public Works Department. A marquee meeting the City's sign Ordinance may be acceptable upon the approval of Public Works Department and obtaining a City sign permit.
- c. All signage must meet the City of Goodyear's Sign Ordinance. Ordinance information can be obtained at the Community Development Department at 932-3494.

11. Parking

- a. All parking shall meet the City of Goodyear's parking requirements stipulated in the Parks Master Plan and City zoning requirements.
- b. Parking lots lights shall meet all current Illuminating Engineering Society (I.E.S.) standards and City Zoning requirements.
- c. Non-deciduous trees (24 inch boxes minimum) shall be planted adjacent to parking lots to provide shading. An acceptable ratio is one tree per every five parking stalls.

7.6 LANDSCAPING FOR FLOOD RETENTION BASINS

7.6.1 Sprinkler Systems for Flood Retention Basins

- A. All sprinkler systems installed in the City shall conform to the following specifications:
 - 1. A flood irrigation system may be used for flat level areas, if available. A sprinkler irrigation system must be used for all areas not covered by flood irrigation which will be developed as turf.
 - 2. The City will review and approve all irrigation systems prior to any installation. All sprinkler systems shall be automatic, and shall utilize a pressure type vacuum breaker or reduced pressure vacuum breaker (as required) before the remote control valves. All applicable codes shall be adhered to and a permit will be required. All plans submitted for approval must specify the brand, model, and nozzle size(s) of the head; the brand, model, and size of all electric valves; the brand and model number of the electric controller; and all pertinent data on such miscellaneous items as valves boxes and covers, size and type of pipe, all necessary details and friction pressure loss calculations for the longest run in the system for both full-circle and part-circle circuits.
 - a. Excavation, Backfilling, and Compaction
Trenches for sprinkler lines and control wiring shall be excavated to a minimum depth of 18 inches for mains under constant pressure and 12 inches for laterals not under constant pressure. When in common trenches, all control wires shall be placed first, followed by a layer of fine backfill; then the main line followed by a minimum of 6 inch fine backfill; then the laterals, and final backfill and compaction, all in accordance with Section 601 of the Maricopa Association of Governments' Specifications.
 - b. Existing Utilities and Structures
The developer shall protect existing structures and utility services and be responsible for their replacement. Minor adjustments to the system will be permitted to clear existing obstructions subject to the approval of the City.

- c. **Materials**
Once the plans have been approved by the City, no substitutions shall be allowed, except when unavailable from the supplier, and another approved product is locally available. All such substitutions must be approved in writing by the City. All materials shall be new and the best of their class and kind. All materials and workmanship shall be guaranteed for a period of one (1) year against defective material and workmanship.

3. Inspections

- a. The City shall be required to inspect and approve the work at the following stages of completion. Any work completed without these inspections must be removed prior to acceptance of that phase of the work. These stages are:
 - (1) Completion of all trenching and installation of all control wires prior to backfilling.
 - (2) Installation of all main line piping prior to backfilling, including the vacuum breaker, quick coupler circuits, and any shut-off valves. The main line shall be pressure tested for 30 minutes at this inspection.
 - (3) Installation of all lateral valves, lines and heads.
- b. **Flushing and Testing**
After all new sprinkler piping and risers are in place and connected and all necessary division work has been completed and prior to the installation of sprinkler heads, control valves shall be opened and a full head of water used to flush out the system. After the system is thoroughly flushed, risers shall be capped off and the system pressure tested prior to backfilling the laterals.

- c. As-Built Drawings
The developer shall be responsible for providing photo mylar (4 mil) drawing system with all changes in location marked on the drawing. This shall be submitted to the City prior to final acceptance. (See As-Built Requirement Section 10.1 for specifics.)
- d. Control Cable
All wiring to be used for connection of the automatic controller to the electric solenoid actuated remote control valves shall be Type UF-600V, 7 strand or solid copper, PVC insulation, single conductor, UL approved underground feeder cable. All pilot or "hot" wires are to be one color and all "common" wires are to be of another color. Wiring shall conform to local codes and shall be installed according to the manufacturer's recommendation. Minimum wire size shall be No. 14.

4. Pipe

- a. No galvanized pipe shall be used. Schedule 80 PVC nipples shall be used for sprinkler swing joints, and Type K hard copper shall be used for all main line piping above grade, and extending 18 inches below finished grade.
- b. Plastic PVC lines below paving shall be installed within separate Schedule 80 sleeves (sized, as required). Piping shall be installed by jacking, boring, or hydraulic driving.
- c. All pipe (PVC or copper) installed in rocky or caliche soils shall be thoroughly embedded and completely covered in sand or approved imported topsoil.
- d. Plastic Pipe
 - (1) Plastic pipe shall be as described on the drawings. It shall be unplasticized PVC extruded from virgin parent of the type specified on the plans. The pipe shall be homogeneous throughout and free from

cracks, holes, foreign materials, blisters, deleterious wrinkles, and dents.

- (2) All pipe shall be continuously and permanently marked with the following information: Manufacturer's name, size, schedule, and type of pipe, working pressure at 73 degrees Fahrenheit, and N.I.S.F. approval.

- e. Plastic Pipe, Fittings and Connections on Mains
All pipe and fittings shall be approved Type 1, Grade 1, PVC, Schedule 80 pipe, conforming to A.S.T.M. D1784-65T and D2241-L65T, and shall be either solvent weld pipe or rubber ring joint pipe. When a connection is plastic to metal either a PVC Schedule 80 nipple, brass nipple, or male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Permatex Type II.

5. Plastic Pipe, Fittings and Connections On Laterals

- a. All pipe shall be as follows:

½ inch - PR 315, PVC

¾ inch and 1 inch - PR 200, SDR 32, PVC

1-1/4 inch and up - PR 160, SDR 26, PVC

- b. All fittings shall be molded fittings manufactured of the same materials as the pipe and shall be suitable for either solvent weld or screwed connections. Use male adapters as described above. Only Schedule 80 PVC pipe may be threaded.

6. Installation of Plastic Pipe

Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer. Plastic pipe shall be cut with a hand saw or hack saw with the assistance of a squared-in sawing vise, or in a manner so as to insure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth, unobstructed flow will be obtained. Pipe for use with rubber gaskets will be tapered as recommended by the manufacturer.

7. Remote Control Valves and Valve Boxes

- a. Remote control valves shall be electric and have brass or bronze bodies and flow controls, and shall be either Griswold SF Series, Rainbird EFA Series, Royal coach 20000 Series, or Johns-Mansville 930G Series, and shall be installed per manufacturer's recommendations.
 - b. Remote control valve boxes shall be either Ametek 10-170-001 box and cover, or approved equal. All electric remote control valves shall be of the same manufacturer as the automatic electric controller and should be of the globe type.
 - c. All lids shall have snap-type locking devices.
8. Pressure Type Vacuum Breaker Assembly
- a. Shall be either S.M.R. P-720 in 1-1/4 inch or 2-inch sizes, or Febco Model 765 in sizes from 1/2 inch to 2 inches. Pressure Vacuum Breaker Assemblers shall consist of an approved check valve, vacuum relief, inlet and discharge shutoffs and field testing cocks. All nipples and other fittings shall be red brass. Vacuum breakers shall be rated at 150 psi working pressure and shall withstand water temperatures to 160 degrees Fahrenheit.
 - b. The assembly shall be mounted 12 inches above the highest head in the system it is protecting, and adjacent to a fence or structure when available. Vacuum breakers must comply with local and state codes and the foundation for Cross-Connection Control Research, University of Southern California.
9. Sprinkler Heads
- a. Sprinkler heads shall be Impact Drive, Rotary Pop-up or Gear Drive Sprinklers, both part circle and full circle types. They shall be constructed of the following materials:
 - (1) Bodies shall be cast bronze, cast aluminum with vinyl coating, or cast iron with vinyl coating.

- (2) All internal workings must be constructed of cast bronze, machined brass, or stainless steel, except for seals, wipers and strainers.
 - (3) All lids shall be rubber covered.
 - (4) Note: All acceptable sprinkler heads have not been listed; other makes and models must be submitted to the City for approval.
- b. The following manufactures and models are acceptable:
- (1) Royal Coach Models 10060, 10061, 10070, 10071, 10080, 10090, 10091, 10092, 10100, and 10110.
 - (2) Rainbird Models 27, 37, 47, 21, 31, 41, 41K and 51.
 - (3) Johns-Mansville/Buckner Models 8250, 8255, 8260, 8265, 8280, 8281, 8282, 82831, 8283Hi, 8283B, and 8283HB.
 - (4) Toro 640.
- c. All heads of a particular type of function in the system shall be of the same manufacturer and shall be marked with the manufacturer's name and identification in such a position that they can be identified without being removed from the system. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans. Sprinkler heads adjacent to existing walks, curbs, or other paved areas, shall be set to grade. All nozzles on rotary pop-up sprinklers shall be tightened after installation. All sprinklers shall be tightened after installation. All sprinklers having an adjustment stem shall be adjusted on a lateral line for the proper radius, diameter and/or gallonage.
- (1) Swing Joints
All sprinklers and quick coupler valves shall be installed on swing joints consisting of two (2) lengths of PVC Schedule 80 nipples (6 inches long) attached with two (2) PVC

street ells (mipt by fipt) and one PVC ell (fipt by fipt) so that the sprinkler can rise or fall without breaking the pipe.

10. Electric Controller

- a. The sprinkler controller shall be capable of operating on 115 volts, 60 cycle A.C. current, and shall provide output current of 25-26.5 volts a 1.1 amps for electric solenoid valves, an 115 volts for a pump start circuit (if required). Controller shall be pedestal mount or wall mount with factory supplied hardware for either. Controller shall be sized to perform the sprinkling efficiently and adequately, and the electric solenoid valves must be of the same manufacturer as the Controller.

(1) The following manufactures and models are acceptable:

- Rainbird RC - 12A, RC - 18A and RC - 23A.
- Griswold SR - 12, SR - 18 and SR - 24.
- Johns-Mansville/Buckner: KCS - 12T, KCS - 24T.
- Royal Coach: 34020, 35010, and 35011.
If less than 12 stations are needed, a Rainbird RC - 8 or RC - LS controller will be required. No other controller will be allowed.

11. Gate Valves

- a. Gate valves shall be bronze, in sizes of 1/2 inch through 2-1/2 inches, and cast iron, in sizes of 3 inches through 12 inches.
- b. The body of bronze valves shall be of heavy duty bronze conforming to the requirements of A.S.T.M. B62 (85-5-5-5), or approved equal. Valves shall have a service rating for non-shock, cold water, or 200 pounds per square inch. Valves shall be of the

double disc, taper seat type with non-rising stem, union bonnet and handwheel. Identification of valves by trade name, manufacturer, etc. shall be stamped or cast on the valve. Valves shall be assembled as detailed on the plans or as specified in the special provisions.

- c. The body of the heavy, bronze valves shall conform to AWWA Standard C-800-89 or approved equal. Valves shall be a spherical, flouorocarbon brass ball. Valves shall have a service rating for non-shock, cold water of 300 pounds per square inch.

12. Check Valves

- a. Check valves 2 inch and smaller shall be swing type, bronze bodied with threaded connections and replaceable composition disc, rated at 150 pounds S.W.P.
- b. Check valves 2-1/2 inch and larger shall be swing type iron body, bronze mounted with flanged or threaded connections and replaceable rubber disc, rated at 126 pounds S.W.P.

13. Booster Pumps

If the pressure is not sufficient to operate the sprinklers efficiently, the City may require a booster pump. This pump must be enclosed within a 6-foot high slump block wall along with the controller, vacuum breaker and all electric controls. Access is to be by a 6-foot chain link gate with lock. The City will assist in the selection of an acceptable booster pump. If a booster pump is used, a reduced-pressure backflow, prevention assembly will be required in lieu of a pressure type vacuum breaker.

14. Pipe Routing shall be as follows:

- a. Meter to vacuum breaker - Schedule 80 PVC or Type K soft copper.
- b. Vacuum breaker risers - Type K hard copper.
- c. Exposed pipe to booster pump (if required), Type K hard copper.

- d. All other exposed main line pipe - type K hard copper.
- e. All buried mains and laterals downstream of vacuum breaker (or booster pump) - PVC pipe as outlined under No. 10,11 and 12.

15. Water for Trees

- a. All trees shall receive water from one of the following systems:
 - (1) An emitter system with electric solenoid valves, Y-strainer and pressure regulating valve, or
 - (2) A bubbler system with electric solenoid valves, surface bubblers and PVC pipe, or
 - (3) An underground soaker pipe system with electric solenoid valves.

7.6.2 Landscaping Specifications for Flood Retention Basins

- A. Native Desert shall be permitted where retention is directly adjacent to preserve lands. Native Desert landscaping shall be reviewed on a case by case basis.
- B. Gravel is an acceptable landscaping for flood retention basins. Gravel landscaping shall be reviewed on a case by case basis.
- C. Lawn Construction
 - 1. Materials
 - (1) Seed

The kind of seed planted shall be appropriate for the planting season, and shall be one of the following:

 - Winter Lawn Seed

Shall be annual Rye grass (*Lotium Multiflorum*) planted from September 15 to April 15; shall have a minimum percentage of purity and germination of 95% and 88% respectively. At the developer's option, he may wait until April 15, or

plant Rye. If Rye is planted, the developer must provide the City Bermuda grass seed to be used for reseeding the following summer. The Bermuda seed shall comply with requirements noted in this Section. The amount of seed shall be based on the application rate specified in Sub-section 6)b). The seed shall be delivered to the City prior to acceptance of the basin.

- Summer Lawn Seed
Shall be common Bermuda (Dyndon Dactylon) planted from April 15 to September 1; shall be fancy hulled seed having minimum percentage of purity and germination of 94% and 88% respectively and a weed seed content not exceeding 0.35%.

- (2) Mulch
Shall be one of the following decomposed stabilized and fortified, treated (nitrolized) wood products with no more than 1% nitrogen after treatment: Fir mulch, Pine mulch, or Redwood mulch.

2. Soil Test in Lieu of Removing and Replacing Topsoil
If the developer has a specific reason for not removing and storing the topsoil, he may request to perform grading without replacing topsoil. If the City concurs, upon final grading of the site, soil samples will be taken by the developer for analysis and recommendations will be made for improving the soil; if necessary, by an independent soils lab. Any recommendations must be implemented by the developer and inspected by the City prior to proceeding with lawn construction.
3. Moisture Content
The soils shall not be worked when the moisture content is so great that excess compaction will occur; nor when it is so dry that a dust will form in the air or that clods will not break readily. Water shall be applied if necessary to

provide ideal moisture content for tilling and for planting herein specified.

4. Where soil tests show that existing topsoil is satisfactory, a seedbed shall be prepared by scarifying to a depth of at least 3 inches and dragging to a smooth surface. Where existing soil is caliche type, it shall be excavated to a depth of 6 inches, removed from the site, and replaced with acceptable topsoil. Irregularities in the surface shall be leveled before seeding operations commence.
5. After raking, roll entire area in two directions at approximate right angles with a water ballast roller weighing 100 to 300 pounds. Any irregularities that develop shall be re-raked, scarified for bond, and again rolled until the area is true and uniform and free from lumps or depressions. Water shall be applied to surface whenever necessary to insure proper working of soil. No heavy objects except lawn rollers shall be taken over these areas. Grade and compaction must be approved by the City prior to planting.
6. Planting
 - a. Just prior to broadcasting the seed, apply and lightly rake into the surface the following:
 - (1) 5 pounds Ammonium Sulfate (21-0-0) per 1,000 square feet.
 - (2) 15 pounds Superphosphate (0-20-0) per 1,000 square feet.
 - b. After the City has approved the areas to be seeded, the seed will be broadcast at the rate of 3-1/2 pounds Bermuda or 10 pounds of Rye seed per 1,000 square feet. One half of the seed will be sown with the sower moving in one direction and the other half shall be sown with the sower moving at right angles to the first sowing. Broadcasting shall not be done in windy weather.
7. Mulching
 - a. Top dress all seeded areas with an approved wood mulch as specified. Spread mulch evenly over all areas at a rate of one cubic yard per 1,000 square

feet, or as recommended by the manufacturer, which ever is greater.

- b. Lightly roll all areas and thoroughly water with a fine spray. Turf shall then be kept continually moist by watering as often as required.
- c. Any areas that do not root properly shall be replanted at 10-day intervals until an acceptable stand of grass is obtained.

D. Maintenance Period

- 1. The developer shall maintain all planted areas for a period of 2 years, beginning immediately after preliminary City acceptance.
- 2. If all plantings are not acceptable at the end of the maintenance period, the maintenance shall be continued until the work meets City approval.
- 3. During the maintenance period, applications of complete fertilizer (6:10:4) shall be made (at 30 days, 60 days and annually thereafter pursuant to Public Works schedule) at the rate of 20 pounds per 1,000 square feet with each application.
- 4. Maintenance shall include continuous operations of watering, weeding, mowing, rolling, trimming, edging, cultivation, fertilizing, spraying, insect and pest control, re-seeding, replacement, and/or any other operations necessary to assure good normal growth. The developer shall be responsible for applying lawn moth control sprays or other materials, as often as may be required, to protect turfs during the entire maintenance period.
- 5. When the turf has established sufficient root structure and an approximate height of 3 inches, mowing should begin immediately to a 2 inch height and shall be mowed thereafter and reduced in safe increments to a height of 1 inch.
- 6. During the installation period and during the maintenance period, the developer shall be responsible for maintaining adequate protection for all areas. Any damaged planting shall be repaired at the developer's expense.

7. At termination of each maintenance period all turf shall be live, healthy, undamaged and free of infestations. All areas shall be completely void of barren spots larger than 3 inches by 3 inches. Inferior plantings shall be replaced and brought to a satisfactory condition before final acceptance of work will be made. The developer shall immediately replace any and all turf that dies or is damaged.
8. Two (2) inspections shall be made that affect each maintenance period: The first shall be after all plantings have been completely the maintenance period of not less than 60 calendar days, and the second shall be at the end of the 60 day maintenance period. If there are differences due to improper or insufficient maintenance, then maintenance shall be continued by the developer until all work meets with the specifications and can be approved by the City.

7.6.3 Planting of Trees, Shrubs and Groundcover

A. General

All retention basins shall receive a minimum average of ten (10) trees per acre, based on the net acreage, with a minimum of three (3) varieties and a maximum of seven (7) varieties. These trees preferably will be evergreen and fast growing varieties.

B. Quality and Size

1. All trees shall be a minimum size of 15 gallons; shall have sufficient roots to hold the earth together after removal from the containers, but shall not be root-bound. Plants shall have been grown in pots, cans or boxes for a minimum of three (3) months, and a maximum of one year.
2. All plants shall exhibit normal growth and shall be sound, healthy, vigorous, and free from disease, insect infestations, or weeds.
3. Trees shall have a straight trunk throughout their height, and shall be in accordance with the American Standard for Nursery Stock.

C. Nomenclature

For inspection and identification, durable legible labels, stating in weather-resistant ink the correct plant name and size, as specified in the plant list, shall be securely attached to all tree trunks delivered to the site.

D. Material for Planting

1. Manure for mulch
Shall be well-rotted, unleached stable or cattle manure, reasonably free from shavings, sawdust, or refuse and shall contain not more than 10% straw by volume.
2. Humus for prepared soil
Shall be sterile peat or peat-moss, or decomposed stabilized and fortified, treated (nitrolized) wood mulch, with no more than 1% nitrogen after treatment, and shall be fir mulch, pine mulch, or redwood mulch type.
3. Mulch in planting basins
Shall consist of 25 pounds of soil sulphur thoroughly mixed with one cubic yard of manure. Mulch shall be evenly spread throughout the tree basin to a depth of 2 inches.
4. Prepared soil for backfilling tree pits
Shall be composed of three (3) parts of topsoil, two (2) parts of washed clean sand, and one (1) part humus by volume, and thoroughly mixed in insure uniformity. Topsoil shall be natural, fertile, friable soil which shall not be excessively acid or alkaline, nor contain toxic substance harmful to plant growth, and be reasonably free of noxious weeds, clay lumps, clods, stones, roots, stumps, and debris of any kind.
5. Staking materials
 - a. Stakes for supporting trees shall be 2 inches by 2 inches by 8 feet long and shall be straight, sound, stout, and free of knots which weaken the stake. Each tree shall receive two (2) stakes adjacent to the rootball.
 - b. Wire for fastening trunks to stakes shall be No. 12 gauge, annealed galvanized steel (not iron). One wire shall be placed at the top of the stakes, and another half-way down the stakes. If necessary, staple or tack wire to stakes to hold firm.
 - c. Hose to protect trunk from wire shall be new 2-ply reinforced rubber or plastic garden hose.

E. Plant Material

1. Unless otherwise indicated, all plant materials furnished shall be nursery-grown, well-branched, and well-proportioned. All plants are subject to inspection and approval before planting, whereupon all plants found unsuitable shall be removed and replaced.
2. Plants of kinds other than those indicated on the plant list will be considered by the City only upon submission of proof that any plant is not reasonably procurable in the local region and upon prior authorization by essential characteristics as the kind of plant specified in regards to appearance, ultimate height, shape, habit growth, general soil, and other requirements. In no case shall the average cost value of the substituted plants be less than the cost and value of plants indicated.
3. Upon delivery to the site, all nursery stock shall be planted as soon as possible. Until planting, stock plants shall not be exposed to excessive sun or drying winds during planting operations.

F. Setting Plants

Unless otherwise specified, all plants shall be planted in pits and shall be set so that the finish grade level after settlement will be the same as that at which plants were grown. They shall be planted upright and faced to give the best appearance and relationship to adjacent plants or structures. All trees shall be set plumb and rigidly braced in position until the soil has been tamped solidly around the ball. Plants shall be backfilled with planting soil which shall be thoroughly settled by watering and tamping to fill all voids. A water basin shall be created at the base of each tree, and shall be a minimum of 4 feet in diameter. Side slopes shall be no greater than 3:1.

G. Cleanup

Any soil, manure, or other material dropped onto paved areas by hauling operations or otherwise, shall be removed promptly, keeping these areas clean at all times. Upon completion of planting, all excess soil, stones, and debris not heretofore disposed of under this scope of work, shall be removed from the site or disposed of as directed by the developer.

H. Maintenance Period

1. The developer shall maintain all trees for a period of 2 years beginning with the preliminary acceptance by the City. If all trees are not healthy at the end of the maintenance period, the maintenance shall be continued until the trees meet the approval of the City, or are replaced.
2. The contractor shall guarantee all plant material to be in a vigorous, healthy condition for a period of 2 years from the date of acceptance or replacement and shall guarantee to replace any plant material which proves to be not true to name, regardless of the length of time it takes to make this determination.

I. Approved Tree List for Flood Retention Basins

Note: All acceptable trees have not been listed; other varieties must be reviewed by the City for approval.

The following trees may be planted in retention basins:

TREES FOR LOWER/LOWER HALF OF BASIN		REFERENCE RATING
Acacia farnesiana	- Sweet Acacia	B
* Acacia Salicina	- Willow Acacia	A
* Acacia stenophylla	- Shoestring Acacia	A/C
Brachychiton populneus	- Poplar-Leaved Kurrajong	A
Casuarina equisetifolia	- Horsetail Tree	B
Casuarina stricta	- Beefwood	B
Cercidium floridum	- Blue Palo Verde	A
Eucalyptus viminalis	- Manna Gum	A
Eucalyptus rudis	- Desert Gum	A
Eucalyptus camaldulensis (rostrata)	- River Red Gum	A
Eucalyptus sideroxylon	- Red Ironbark	B
Geijera parviflora	- Australian Willow	B
Gleditsia triacanthos inermis	- Thornless Honey Locust	
	"Moraine"	B
	"Imperial"	A
	"Shademaster"	A
Lysiloma Microphylla (var. Thornberi)	- Feather Bush	A/C
Pinus canariensis	- Canary Island Pine	A
Pinus brutia eldarica	- Eldarica Pine	A
Pinus halepensis	- Aleppo Pine	A
Pithecellobium flexicaulli	- Texas Ebony	B
Rhus lancea	- African Sumac	A
TREES FOR LOWER AREA/LOWER HALF OF BASIN		REFERENCE RATING
Casuarina equisetifolia	- Horsetail Tree	B
Casuarina stricta	- Beefwood	B
Eucalyptus viminalis	- Manna Gum	A
Eucalyptus camaldulensis	- River Red Gum	A
Salix babylonica	- Weeping Willow	B
Populus Fremonti	- Freemont Cottonwood	A
Flaxinus Velutina	- Arizona Ash	A
Flaxinus Velutina "Modesto"	- Modesto Ash	A

* Indicates trees which require three (3) support stakes.

A indicates trees that are excellent for specimen use.

B indicated trees that are good for specimen use.

A/C indicates trees good for specimen use, but not preferred in large quantities.

Note: All trees with spreading habit, seed pods or thorns to be planted a minimum of 15 feet from walls, walks, and pavements.

8.1 SITE PLAN

8.1.1 General Information

8.1.2 Condominium Plats

A. General Comments

Improvement plans for condominium development in Goodyear are handled by the City staff in the same manner as an apartment development is handled except that plats are required for the division of living space for the future condominium owners.

B. Condominium Development Plats That Do Not Include Dedications to the Public.

If the plat is not also used as a map to dedicate land to the public or to grant easements for public purposes, the minimum requirements described in the following subparagraphs must be met to secure City approval of the plat.

1. Six copies of the plat must be submitted to the City on 24-inch by 36-inch paper for review.
2. Because of the need to update its quarter-section maps, the City prefers the plats to be drawn to a scale of 1" = 100'. If this scale is not appropriate for the development, use a scale which, when multiplied by a whole number, will equal 1" = 100'.
3. A title report for the development property shall be submitted with the plat. The report must be dated within 30 days prior to the acceptance date.
4. All lettering, numbers, and drawings must be clear and distinct and of sufficient size to enable the City to have usable records when drawings are microfilmed. Design Standards and Policies manual, Section 2.1, Construction Plan Requirements, describes the minimum requirements for lines, lettering, and numbers which must be met.
5. The name of the development must be shown prominently.
6. Following the development name, state the quarter sections) within which the proposed subdivision is to be located; for example: "A condominium development of Part of the SE quarter of Section 10, Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian,

Maricopa County, Arizona”. This statement should be followed by a complete legal description of the development boundaries.

7. Prepare the drawing of the plat so that the direction of north will either be toward the top of the sheet or toward the right side of the sheet, whenever possible. (The top of the sheet will have the 36-inch dimension.) All notations should be oriented to read with north pointed up. A north arrow shall be provided in a prominent manner with a notation indicating the scale of the drawing.
8. Provide a small vicinity map showing the relationship of the proposed development to the nearest arterial and major collector streets. The orientation of the vicinity map must agree with the orientation of the map drawing, but the vicinity map does not have to be drawn to a particular scale. The surrounding zoning shall be shown on the vicinity map.
9. Provide a legend with appropriate abbreviations and drawing symbol explanations. See Design Standards and Policies manual, Chapter 2 Construction Plan Requirements, for specific requirements with regard to symbols.
10. Each development must have two survey ties to two separate existing monuments. The monuments are to be used as the basis of bearing. These ties must be shown together with the bearings and distances, curve lengths, central angles, radii, etc. for all the development boundary lines. All corners must be identified and notes must indicate whether they were found or set.
11. The floor elevations for each residential unit must be tied to the City of Goodyear’s vertical control datum and the residential unit boundaries must be tied by appropriate dimensions to the development boundary lines.
12. Show and identify all abutting rights-of-way, easements, subdivisions, unsubdivided land, etc. on the property adjacent to the proposed development. The Maricopa County Recorder’s office recording information for adjacent dedications, plats, etc. must be shown.
13. Identify each subdivided condominium space by number and all tracts of land for common use by letter. Provide

bearings, distances, dimensions, and curve data necessary for the complete description of each subdivided space or tract. Since there are no dedications to the public on condominium plats covered under this section, all areas within the development that are not occupied by residential units are common areas and must be designated as tracts.

14. Since the streets in the development are to be private streets, the condominium plat must have a note stating the following:

“The streets are private streets, to be owned and maintained by the property owners association. After this plat is recorded, the City of Goodyear will not accept dedication of the streets to the public in order to relieve the property owners association of street maintenance responsibilities, unless streets are brought up to current City standards.”

15. An assured water supply must be available for each condominium development; therefore, one of the following statements must appear on the plat:

- a. If the development is within the City of Goodyear water service area, use the following:

“This development is on the City of Goodyear Water System, which has a certification of assured water supply.”

- b. If the development is served by any water district other than the City of Goodyear, the following must be used.

“A certificate of assured water supply has been submitted to the City of Goodyear for this development.”

16. A certification must be provided by a land surveyor registered to practice in Arizona stating that the plat was made under his direction and meets the minimum standards for Arizona Land Boundary Surveys.

- 17.

Provide in block form in the lower right-hand corner of the plat the following information:

- a. Land surveyor's name and address
 - b. "Map for (name and development)
 - c. Date prepared and job numbers
 - d. Scale
 - e. "Sheet ____ of ____ sheets
18. Each condominium plat must have a signature block for the Project Coordination Manager recommending approval, and for the Project Review Director's approval.
19. At the time approval is to be given by the City, the original plat drawing and two photo mylar copies or three photo mylar copies of the original drawing must be submitted to the City for receipt of approval signatures of the City Engineer and City Mayor. Digital Mylars are an acceptable alternate if submitted with a disk or CD copy. Ammonia mylar copies of the plat are not acceptable. All signatures must be in black ink. The mylar film should be at least 3 mils thick.

C. Condominium Plats That Include Dedications To The Public

If a condominium plat is used to dedicated land to the public or to grant easements for public purposes, the requirements described under paragraphs 8.1.2.B.1-19. apply. In addition, the requirements under paragraph 8.1.3. which are not listed under 8.1.2.B. also apply.

8.1.3 Maps Of Dedication

A. General Comments

The following requirements apply to the preparation of maps which are to be used to dedicate land to the public or to grant an easement to the public for roadway, drainage, flood control, utility line, emergency or service vehicle access, or other public uses. Some of these requirements may be waived by the Project Review Director if it is demonstrated that the requirements are not appropriate because of the size or nature of a development.

B.

Map Requirements

1. Ten copies of the map, in compliance with Maricopa County Recorders Office standards, must be submitted to the City for review.
2. A title report for the property to be dedicated shall be submitted with the map. The report must be dated within 30 days prior to the acceptance date.
3. All lettering, numbers, and drawings must be clear and distinct and of sufficient size to enable the City to have usable records when drawings are microfilmed. Design Standards and Policies manual, Chapter 2 Construction Plan Requirements, describes the minimum requirements for lines, lettering, and numbers which must be met.
4. A map title must be shown prominently and if this dedication is related to a specific development, the identification of the development should be part of the title.
5. Following the map title, state the quarter section(s) within which the property to be dedicated lies; for example, “A parcel of land in the SE quarter of Section 10, Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County Arizona”. This statement should be followed by a complete legal description.
6. Prepare the drawing of the map so that the direction of north will either be toward the top of the sheet or toward the right side of the sheet, whenever possible. (The top of the sheet will have the 36-inch dimension.) All notations should be oriented to read with north pointed up. A north arrow shall be provided in a prominent manner with a bar scale indicating the scale of the drawing.
7. Provide a small vicinity map showing the relationship of the dedicated property to the nearest arterial and major collector streets. The orientation of the vicinity map must agree with the orientation of the map drawing, but the vicinity map does not have to be drawn to a particular scale.
8. Provide a legend with appropriate abbreviations and drawing symbol explanations. See Design Standards and Policies manual, Chapter 2 Construction Plan

Requirements, for specific requirements with regard to symbols.

9. Each development must have two survey ties to two separate existing monuments. The monuments are to be used as the basis of bearing. These ties must be shown together with the bearings and distances, curve lengths, central angles, radii, etc. for all the development boundary lines. All corners must be identified and notes must indicate whether they were found or set.
10. Show and identify all abutting rights-of-way, easements, subdivisions, unsubdivided land, etc. on the property adjacent to the property being dedicated. The Maricopa County Recorder's office recording information for adjacent dedications, plats, etc. must be shown.
11. All easements that are for drainage and flood control, landscaping, buffer zones, scenic corridors, etc. must be provided with a statement indicating the agency responsible for their maintenance.
12. Public utility easements shall provide the same utility easement rights to the City of Goodyear.
13. If a common area for a condominium development will be used as a "blanket easement" for public utilities, the areas which will be used for swimming pools, saunas, or other permanent structures (other than dwelling units) should be shown as exceptions to the "blanket easement".
14. A dedication statement is required for all road rights-of-way and easements to be dedicated to the public. The signature of the owner must be acknowledged by a notary public or other authorized officer, as set forth in Arizona Revised Statutes.
15. If any property is encumbered by a Deed of Trust, Mortgage, and/or Agreement, the lender must ratify (consent to and approve) the map. The ratification must reference the date the lien was recorded and the docket and page in which the instrument was recorded by the Maricopa County Recorder's office.
 - a. If the lender is a corporation, a certified copy of a resolution showing who is authorized to sign on

behalf of the corporation shall accompany the plat when submitted to the City for recording.

- b. If a partnership and/or joint venture is involved, a copy of the partnership or joint venture agreement must be submitted to the City for review. If either agreement does not designate an individual to sign on behalf thereof, it should be accompanied by a resolution covering same.
 - c. Lender's signature must be acknowledged before a notary.
16. A certification must be provided by a land surveyor registered to practice in Arizona stating the map was made under his/her direction and meets the minimum standards for Arizona Land Boundary Surveys. His/her seal must be placed on each sheet of the map.
17. Provide in block form in the lower right-hand corner of the map the following information:
- a. Land surveyor's name and address.
 - b. Map for (name of development).
 - c. Date prepared and job numbers.
 - d. Scale.
 - e. "Sheet ____ of ____ sheets".
18. Each map of dedication must have a signature block for the City Engineer recommending approval, and an approval signature block for the City Mayor.

C. Maps to be Recorded

- 1. Each map which dedicates land or grants an easement for public use must be recorded by the Maricopa County Recorder. The original drawing and two photo mylar copies or three photo mylar copies of the original drawing must be submitted to the City for receipt of the signatures of the City Mayor. Ammonia mylar copies of the map are not acceptable. The mylar film should be at least 3 mils thick.
- 2.

All signatures must be in black ink. The name of the title company, name of the title officer, and the title company telephone number are required at this time. When the approval signatures have been provided, the City will contact the title company to have the map recording handled by that company. If the developer or the engineer wishes to submit additional photo mylar copies for approval signature, he may do so.

8.2 SITE DEVELOPMENT - DESIGN AND CONSTRUCTION

8.2.1 General Information

All new developments shall provide for vehicle parking, refuse collection, Fire Department access, landscaping, waste control, on-site private water and sewer systems, and on-site storm water retention per all applicable City codes, ordinances and the following standards:

8.2.2 Refuse Collection Stations - Design and Construction

- A. The City requires that all refuse shall be collected and disposed of by the City. If the City cannot provide the service, a private contractor may be issued a permit to provide the service. For information on schedules and collection fees, contact the Utilities Services Supervisor at 932-1637.
- B. All service and construction of enclosures will be in accordance with Maricopa County Health codes.
- C. All developments shall provide areas for refuse containers per the following guidelines:
 - 1. Multi-family developments
 - a. Refuse containers will be provided by the City at the rate of one - three (3) cubic yard container per 15 units, or equivalent.
 - b. The developer shall construct a concrete pad for each required container or for each pair of containers. The concrete pad shall be 10' wide x 10' deep x 6" thick for a single container: 13' wide x 10' deep x 6" thick for a double container station or 19' wide x 10' deep x 6" thick for triple container station. Measurements are all inside measurements.
 - c. The container station shall be located immediately adjacent to an interior driveway or private street improved to City standard. The City will not be responsible for repairing any damage to the pavement incurred during normal collection activities. The concrete pad shall be at an elevation matching the adjacent pavement and graded to provide positive drainage.
 - d. All multiple container stations shall be located on the same side of the driveway or private street, so

that the collection truck may be routed through the site in one direction only. Collection shall be from the right side of the truck.

- e. The driveway or private street, along which the container station is located, shall provide access through the site or a turn around with a turning radius of 55' (minimum) if it is a dead end.
- f. Container stations shall be free of all obstructions adjacent and overhead, for a distance of 20'.
- g. Container stations shall be enclosed and gated. It shall be the owner's responsibility to insure that the gates are open when the City's collection truck arrives or the collection will not be made.

2. Commercial/Industrial Developments

- a. Refuse containers will be provided by the City or Contractor. Size of the container and frequency of collection required will be determined by the City on an individual basis based on the amount of refuse generated. A business generating more than 20 cubic yards per week will require a 20 cubic yard or 40 cubic yard refuse container or a compactor to be installed whenever practicable.
- b. There are six (6) different sized containers available. They are:
 - (1) two (2) cubic yard
 - (2) three (3) cubic yard
 - (3) five (5) cubic yard
 - (4) ten (10) cubic yard
 - (5) twenty (20) cubic yard
 - (6) forty (40-50) cubic yard
- c. The two and three cubic yard container stations shall be located and constructed per the guidelines in the previous section covering multi-family developments.
 - (1) The developer shall construct a concrete pad for each required container. The concrete

pad shall be 10' wide x 10' deep x 6" thick for a single container or 13' wide x 10' deep x 6" thick for a pair of containers. Measurements are all inside measurements.

- (2) Restaurant only.
Size of concrete pad will be increased to 19' wide x 12' deep x 6" thick if other items such as grease cans, soft drink cylinders or plastic trays will be placed inside enclosures with refuse containers.
- (3) Location of enclosure/concrete pad. All container stations shall be located on the same side of the driveway or private street, so that collection truck may be routed through the site in one direction only from the right side.
 - ◆ Containers will not be at a dead end street unless there is a turning radius of 55 feet.
 - ◆ Container stations shall be free of all obstructions, adjacent and overhead, for a distance of 20 feet.
 - ◆ The twenty and forty cubic yard containers shall be located such that the containers may be rolled on/off the transport truck. This requires a pad area 20-ft. wide x 22-ft. deep x 6-in. thick parallel with the driveway, with adequate area in the front for the transport truck to maneuver.

8.2.3 Waste Control

- 1. Multi-family developments
 - a. Swimming pool connections
 - (1) Swimming pool waste water shall be allowed to be pumped to the sanitary sewer through an indirect drain. Maximum pumping rate shall not exceed one half of

the calculated capacity of the receiving sanitary sewer nor 100 gallons per minute.

- (2) Indirect drain connections shall be designed, located and constructed to exclude surface or underground water from the sanitary sewer.
- (3) The indirect drain connection shall provide an air gap, equal to two times the diameter of the waste water discharge pipe, between the lowest opening of the waste water discharge pipe and the flood level rim of the receiving plumbing fixture.
- (4) Swimming pools having a pressure or gravity sand type filter shall be allowed to connect to the sanitary sewer only through an indirect drain.

b. Laundry room facilities

- (1) Laundry rooms with ten or more washing machines shall be equipped with a 350-gallon lint interceptor, Smith Pre-Cast or approved equal.
- (2) No wastes other than those requiring treatment or separation shall be discharged into the lint interceptor.
- (3) Each interceptor shall be properly vented and shall have a clean out on the discharge pipeline.
- (4) For outside installations, the interceptor shall be elevated three (3) inches above existing grade to exclude surface water.
- (5) The interceptor shall be located as to be readily and easily accessible for cleaning and inspection.

2.

Commercial developments

a. Interceptors are required:

- (1) Grease, oil, or sand interceptors shall be provided for laundries, restaurants, service stations, auto repair shops, car washes and other facilities when the City determines they are necessary for the proper handling or liquid wastes containing grease or oil in excessive amounts or any flammable wastes, sand, and other harmful ingredients.
- (2) All interceptors shall be of a type and capacity approved by the City and shall be located as to be readily and easily accessible for cleaning and inspection.
- (3) Grease and oil interceptors shall be constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, watertight, and equipped with easily removable covers. When bolted covers are required, they shall be gas tight and watertight.
- (4) Where installed, all grease, oil, and sand interceptors shall be maintained by and at the expense of the owner in continuously efficient operation at all times.

b. Cross-connections are prohibited:

- (1) No person shall connect to the City water system any water operated equipment or mechanism, or any water treating chemical or substance, if it is determined by the City that such equipment, mechanism, chemical or substance may cause pollution of the domestic water supply. Such equipment or mechanism may be permitted only when equipped with a backflow prevention device approved by the City.

3.

Industrial Pretreatment

- a. Preliminary treatment facilities are required:
 - (1) Where necessary, as determined by the City, any user of the sewer system shall provide at their expense, such preliminary treatment as may be necessary to reduce objectionable characteristics or constituents to within the maximum limits provided for in the Goodyear City Code, Chapter 12. Plans, specifications, and any other pertinent information relating to proposed preliminary treatment facilities shall be submitted for the approval of the City Engineer. No construction of such facilities shall be commenced until the City Engineer's approval is obtained in writing. The completed facilities shall not be placed in service until they have been inspected for conformance to the approved plans and the final construction approved by the City Engineer. The approval of the plans and inspection of construction shall not relieve the owner from complying with discharge limitations set forth in the Goodyear City Code, Chapter 12. The City shall enforce Federal pre-treatment requirements as set forth in the Code of Federal Regulations, Title 40, Part 403.
- b. Cross-connections are prohibited:
 - (1) No person shall connect to the City water system any water operated equipment or mechanism, or any water treating chemical or substance, if it is determined by the City that such equipment, mechanism, chemical or substance may cause pollution of the domestic water supply. Such equipment or mechanism may be permitted only when equipped with a backflow prevention device approved by the City.
- c.

Control vaults are required:

- (1) When required by the City, the owner of any property served by a building sewer carrying potentially harmful or other industrial wastes shall install an industrial waste control vault in the building sewer to facilitate observation, measurement and sampling of the wastes. Such control vault, when required, shall be accessible and safely located and shall be constructed in accordance with plans approved by the City Engineer. The control vault shall be installed by the owner at his expense and shall be maintained by him so as to be safe and accessible at all times. If a manhole servicing only one industrial user is available for sampling, this requirement may be met by installing a lockable water-tight shut off valve in the service line upstream of the sampling manhole.
- (2) Industries included in, but not necessarily limited to, the following list shall install a control vault in the building sewer:
 - ◆ Adhesives manufacturing
 - ◆ Aluminum forming
 - ◆ Asbestos manufacturing
 - ◆ Battery manufacturing
 - ◆ Carbon black manufacturing
 - ◆ Coil coating
 - ◆ Copper forming
 - ◆ Electrical and electronic components manufacturing
 - ◆ Electroplating
 - ◆ Feedlots
 - ◆ Ferroalloy manufacturing
 - ◆ Fertilizer manufacturing
 - ◆ Food Processing Plants

- ◆ Foundries (metal molding and casting)
- ◆ Glass manufacturing
- ◆ Grain mills
- ◆ Ink formulating
- ◆ Inorganic chemicals manufacturing
- ◆ Iron and steel manufacturing
- ◆ Laundries
- ◆ Leather tanning and finishing
- ◆ Mechanical products manufacturing
- ◆ Metal finishing
- ◆ Metal molding and casting (foundries)
- ◆ Nonferrous metals manufacturing
- ◆ Paint formulating
- ◆ Pesticide chemicals manufacturing
- ◆ Petroleum refining
- ◆ Pharmaceutical manufacturing
- ◆ Plastic Manufacturing/Moulding
- ◆ Porcelain enameling
- ◆ Printing and publishing
- ◆ Pulp, paper and paperboard manufacturing
- ◆ Rubber manufacturing
- ◆ Soap and detergent manufacturing
- ◆ Steam electric power generating
- ◆ Sugar processing
- ◆ Tars and asphalt paving and roofing materials manufacturing
- ◆ Textile mills
- ◆ Timber products processing

8.2.4

Vehicle Parking and Storage Yard Facilities - Design and Construction

- A. All developments shall provide for on-site vehicular parking per the following guidelines:

Current City of Goodyear Zoning Ordinance Requirements for Off Street Parking and Loading.

8.2.5 Fire Department Access

- A. General Information

All developments shall provide access for Fire Department vehicles and personnel per the following guidelines. The Fire Department has the right of final approval and may revise these guidelines as individual situations require.

- B. Access width and turning radius

1. A 20-foot (minimum) wide access is required for fire department access. See Detail G-3240.
2. Turning radius per Details G-3241, and G-3242 are required at all entrances and interior driveway intersections where access is required.
 - a. Ladder truck access is required for all development except the following:
 - (1) Mini-storage facilities when the office is located adjacent to a public street.
 - (2) Storage yards when non-combustible materials are the only items stored.

- C. Building Access

1. Buildings shall be located so that Fire Department apparatus may be parked within 150 feet of the farthest point on the ground floor of the building. This 150-foot dimension is measured along the route a person would follow from the truck to a given point on the building.
2. A fire sprinkler system shall be installed per Fire Code requirements. Specifications for the sprinkler system vary with the type of development. It is the developer's responsibility to contact the Fire Prevention Section to determine the specific requirements for the development.

3. Fire Department Connections shall be per Section 5.1.2.H.
 4. Retention areas shall not be considered as part of the required access.
 5. Provide a minimum of 14'-6" vertical clearance.
 6. There shall be a minimum 10-foot setback from fire lanes.
 7. Any roadway intended for Fire Department access shall not have a grade greater than 8%.
 8. Fire lane signs shall be posted on Fire Department access perpendicular to the flow of traffic. Signs shall be visible from both directions and mounted between 5 feet to 7 feet above final grade. Signs shall be installed a maximum of 100 feet apart and at any horizontal change in direction. See Detail G-3142.
 9. The Fire Department does not allow speed bumps or any obstructions that may impede on emergency vehicle response on a Fire Department access roadway.
 10. Multi-unit occupancies shall post premises identification, as approved by the Fire Department, when bordering Fire Department access. Numbers shall be on a contrasting background.
- D. Private Security Gates which in the opinion of the Fire Chief and/or the Police Chief hamper the adequate responses to emergencies by Public Safety Services shall be equipped with a Pre-emption Device approved by the Fire Department.
1. The equipment shall be capable of fail safe operation in case of power loss. In the event of an emergency, a means shall be provided to leave gates unlocked.
 2. An approved list of devices may be obtained through the City of Goodyear Fire Department, 932-2300.

8.2.6

Landscaping

A. General Information

All developments shall provide for on-site and right-of-way landscaping per: City of Goodyear Zoning Ordinance. Flood retention basins shall be landscaped in accordance with all applicable zoning standards.

9.1 SUBDIVISION PLATS

9.1.1 General Information

A. General Comments

This chapter describes the City's requirements for preliminary and final plats for subdivisions and for maps dedicating land to the public and easements for public use.

B. Completion of Improvements

No occupancy of any structure built within the development will be authorized by the City until the infrastructure shown on the improvement plans have been completed and approved. No more than 50% of the structure shall be occupied prior to City acceptance.

9.1.2 Subdivision Plats

A. Preliminary Plats

1. General Comments

A preliminary plat shows the approximate location of the street, water and sewer system, the approximate size and configuration of each lot and tract, and other information needed by the City to evaluate the proposed subdivision. Preliminary Plats shall be in conformance with current Subdivision Regulations.

2. General Requirements

Requirements for the plat may come from the zoning ordinance requirements, specific zoning stipulations or Subdivision Regulations. The applicant is responsible for meeting these requirements.

3. Submittal Standards

a. The drawing of the plat shall be to a scale no greater than 1 inch = 100 feet. A plat may be submitted drawn to a scale of 1 inch = 50 feet if the subdivision is equal to or less than ten acres in size.

b. All lettering, numbers, and drawings are microfilmed. Design Standards and Policies manual, Chapter 2 Construction Plan Requirements, describes the minimum requirements for lines, lettering, and numbers which must be met.

- c. The name of the proposed subdivision must be shown prominently.
- d. Following the subdivision name, state the quarter section(s) within which the proposed subdivision is to be located. For example: "A Subdivision of Part of the SE 1/4 of Section 10, Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona." This statement should be followed by a complete legal description of the subdivision boundaries.
- e. Provide a statement of the name, address, and telephone number of the developer of the subdivision.
- f. Provide a legend with appropriate abbreviation and drawing symbol explanations.
- g. Provide a statement describing the identification, location, and elevation for at least two vertical control benchmarks for the development. The benchmark elevations must be on City of Goodyear datum.
- h. Provide a statement describing the types of utility services to be provided and the names of the utility companies that will be providing the services.
- i. Provide statements describing the existing zoning, the gross subdivision area in acres, the number of lots, the minimum lot size, and the average lot size. Each tract or area which is not to be a lot or public right-of-way must have a note indicating its approximate area, the planned use and improvement, if any, and the agency which is to be responsible for maintaining the tract.
- j. Prepare the drawing of the proposed plat so that the direction of north will either be toward the top of the sheet or toward the right side of the sheet. (The top of the sheet will have the 36-inch dimension.) All notations should be oriented to read with north pointed up. A north arrow shall be provided in a prominent manner, with a bar scale indicating the scale of the plat drawing.

- k. Provide a small vicinity map showing the relationship of the proposed subdivision to the nearest existing and planned arterial and major collector streets. The orientation of the vicinity map must agree with the orientation of the plat drawing. The vicinity map need not be drawn to a particular scale. Surrounding zoning shall be shown on the vicinity map.
- l. Each subdivision must have two survey ties to two existing section line monuments. The monuments are to be used as the basis of bearing. These ties must be shown on the plat drawing, together with the bearings and distances, curve lengths, central angle, and radii, etc. for all of the subdivision boundary lines.
- m. The location and size of all existing easements, rights-of-way, and man-made structures or facilities within the boundary of the proposed subdivision must be shown on the drawing..
- n. Show and identify all rights-of-way, easements, subdivision names, unsubdivided land, etc. on the property adjacent to and within 150 feet of the boundaries of the proposed subdivision.
- o. Indicate by arrows the location, direction, and amount of flow of all natural washes or man-made drainage channels which exist or are planned and which flow through, are adjacent to, or begin within the proposed development.
- p. Number all lots sequentially and identify all tracts by letter. Provide dimensions to indicate the sizes of the lots and tracts. All preliminary plats shall show required setback lines and proposed building envelopes (if known).
- q. Care should be taken in establishing the size and shape of corner lots. A corner lot should not be so small or narrow that the space left for construction of homes and fenced yards is not adequate for the builder or ultimate homeowner.

The space limitations on corner lots are:

Almost all corner lots will have an eight (8) foot public utility easement adjacent to the property line in the yard facing the side street as well as in the front yard. It is also recommended that mail boxes, etc. be located outside of these easements. Good lot design suggests that lots with drainage easements, on adverse terrain or where substantial cuts or fills occur, or along subdivision perimeters will also be larger than the average lot size.

- r. Easements for surface drainage must be wide enough to provide a channel which meets the requirements of good engineering and aesthetic design. Surface drainage easements may be split so that one half lies on one lot and one half lies on the adjacent lot. If approval of a development will require that a wash be retained in its natural state, then supporting hydrologic and hydraulic calculations must be submitted in sufficient detail with the preliminary plat to demonstrate that the easement or tract set as is for drainage will be of sufficient width to carry the peak 100-year storm drainage flow without endangering life or property which is outside the easement or tract and to accommodate usual maintenance equipment. If a development is to have a property owners association, the land area set aside for surface drainage should be on a tract which will be maintained by the property owners association and not on an easement where maintenance responsibility would be split among several property owners.
- s. Show the areas to be used for storm drainage retention or detention. These areas shall be tracts to be maintained by a property owners association. Sufficient dimensions and other information must be provided to describe the size of the area, the approximate depth, and the slop of the sides.
- t. Show all proposed streets and indicate the right-of-way widths. Provide sufficient approximate information on street curvatures, intersection offsets, etc. to enable City staff to verify

compliance with the subdivision ordinance and applicable design standards.

- u. Show the proposed layout of the sewer and water lines and fire hydrant locations to be constructed to serve the development. Indicate the size of the lines and the direction of flow.
- v. Show the street drainage pattern by arrows and indicate those points at which it is intended to add concentrated flow to the street drainage and to remove drainage from the street.
- w. Show the proposed locations of bikeways and horse trails which must be within the boundaries of the plat to coincide with the City's approved development plan for such paths and trails.
- x. Any development on property containing protected native plant material shall submit a native plant program.
- y. If the subdivision is to have property owners association, indicate this on the plat with an appropriate statement as it relates to the duties and requirements as outlined in the CC & R's -i.e. maintenance.
- z. If the streets are to be private, indicate this with a note on the plat, and state that the streets and any street lights to be located within this private right-of-way are to be maintained by the property owners association.
- aa. If the developer intends to have one recorded plat for the whole subdivision, but plans to phase the improvements, the plats should have a statement which indicates this intent, and the proposed phasing should be shown by suitable marking on the plat drawing. Indicate any temporary cul-de-sacs, infrastructure lines, valves, etc.
- bb. If a developer has a large parcel of land which he intends to subdivide with several recorded plats over a period of time, he/she should not attempt to secure a preliminary plat approval for the whole parcel. He/she should submit a master plan for the

whole parcel and a preliminary plat for only the “first phase” for which the developer intends to secure a recorded plat. In the future, subsequent preliminary plats may be submitted which would be in agreement with the master plan.

cc. Provide in block form in the lower right hand corner of the plat the following information:

- (1) The name, address, and telephone number of the individual or agency that prepared the preliminary plat.
- (2) “Preliminary Plat for (name) subdivision.”
- (3) Date prepared and job number.
- (4) Scale
- (5) “Sheet ____ of ____ sheets.”

B. The following requirements apply to the preparation and submission of a final plat for a subdivision.

1. Three copies of the final plat must be submitted to the City on 24-inch by 36-inch paper: one copy with the improvement plans, one copy for planning review and one copy for filing purposes. Review comments on the final plat will be transmitted to the engineer who submitted the plat.
2. The drawing of the plat shall be a scale of one inch = 100 feet. A plat may be submitted drawn to a scale of one inch = 50 feet if the subdivision is equal to or less than ten acres in size.
3. Submit an updated title report dated within 30 days, with and in support of the final plat.
4. All lettering, numbers, and drawings must be clear and distinct and of sufficient size to enable the City to have usable records when the drawings are micro-filmed. Engineering Design Standards and Policies Manual, Section 2.1 Construction Plan Requirements, describes the minimum requirements for lines, lettering, and numbers which must be met.

5. The name of the subdivision must be shown prominently. List any parcel, unit, phase, or number which may apply.
6. Following the subdivision name, state the quarter section(s) within which the proposed subdivision is to be located. For example: "A subdivision of part of the SE quarter of Section 10, Township 3 North, Range 5 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona." This statement should be followed by a complete legal description.
7. Prepare the drawing of the proposed plat so that the direction of north will either be toward the top of the sheet or toward the right side of the sheet, whenever possible. (The top of the sheet will have the 36-inch dimension.) All notation should be oriented to read with the north pointed up. A north arrow shall be provided in a prominent manner with a bar scale indicating the scale of the plat drawing.
8. Provide a small vicinity map showing the relationship of the proposed subdivision to the nearest existing and planned arterial and major collector streets. The orientation of the vicinity map must agree with the orientation of the plat drawing. The vicinity map shall be drawn to a particular scale.
9. Provide a legend with appropriate abbreviation and drawing symbol explanations. See Engineering Design Standards and Policies Manual, Section 2.1 Construction Plan Requirements, for specific requirement with regard to symbols.
10. Each subdivision must have two survey ties. These ties must be shown together with the bearings and distances, curve lengths central angles, radii, etc. for the subdivision boundary lines. All corners must be identified and notes must indicate whether they were found or set.
11. Show and identify all abutting rights-of-way, easements, subdivisions, property lines, etc. on the property within 150 feet adjacent to the proposed subdivision. The Maricopa County Records office recording information for adjacent dedications, plats, etc. must be shown.

12. Identify all lots by sequential numbering and all tracts by letter. Show all lots, tracts, and street rights-of-way to be with the subdivision. Provide the bearings, dimensions, and curve data necessary for the complete description of each lot, tract, and street right-of-way. All areas within the plat boundaries not occupied by lots or public street shall be designated as tracts. The tracts shall be labeled as to use, and the agency (property owners association or City) responsible for the maintenance of the tracts shall be identified by an appropriate note.
13. Care should be taken in establishing the size and shape of corner lots. A corner lots should not be so small or narrow that the space left for construction of homes and fences yards is not adequate for the builder or ultimate homeowner. The space limitations on corner lots are:
 - a. Where a corner lot abuts a key lot, the height and location of walls and fences in the yard facing the side street must conform to the front yard requirements for walls and fences.
 - b. Almost all corner lots will have an 8-foot wide public utility easement adjacent to the property in the yard facing the side street as well as in the front yard.
14. If the subdivision is to have a property owners association, indicate this on the plat with an appropriate statement.
15. Easement Requirements
 - a. No utilities (water, sewer, storm drain) shall be installed in an easement unless the Public Works Director, or his designee, has approved in writing the placement of the utility in an easement(s) and the property owner has granted the necessary easement(s) and right(s)-of-way.
 - b. If approved, utilities outside of public rights-of-way shall be placed in easements not less than twenty (20) feet wide, or at the discretion of the Public Works Director, or his designee. The utilities shall be centered in the easement and shall be accessible from a public right-of-way.

- c. Easements larger than twenty (20) feet in width may be required if other utilities are also located in the easement or if additional area is needed for maintenance equipment access due to the size and/or depth of the line(s). Easements shall be free of obstructions, shall not be located in a fenced area, and shall at all times be accessible to City service equipment such as trucks, backhoes, etc. Areas in question shall be approved in writing by the Public Works Director, or his designee.
 - d. Easements shall be dedicated prior to any construction.
- 16. Public utility easements shall provide the same utility easement rights to the approved City of Goodyear Cable TV license as they do to any other public utility.
- 17. Provide a note stating that when an easement lies within the boundaries of a subdivision lot, maintenance of the easement is the responsibility of the Homeowner's Association except when otherwise specifically noted on the plat as approved by the City.
- 18. A dedication statement is required for all road rights-of-way and easement that are to be dedicated to the public. All private streets or roadways must be tracts. The signature of the owner must be acknowledged by a Notary Public or other authorized officer, as set forth in Arizona Revised Statutes.
- 19. If the street in the subdivision is to be a private street, then the plat must have a note stating the following:

“The streets are private street, to be owned and maintained by the property owners association. After this plat is recorded, the City of Goodyear will not accept dedication of the street maintenance responsibilities unless all street improvements and rights-of-way meet current applicable City standards, unless streets are brought up to current City standards.”
- 20. Prior to recording the final plat, it must have the certification of the Community Development Director and the approval of the Mayor. The City Clerk must attest to the Mayor's signature. Places for these signatures must be provided on the plat.

21. An assured water supply must be available for each subdivision; therefore, one of the following statements must appear on the plat:
 - a. If the development is within the City of Goodyear water service area, use the following:

“This subdivision is on the City of Goodyear Water System, which has a certification of assured water supply.”
 - b. If the development is served by any water district other than the City of Goodyear, the following must be used:

“A certificate of assured water supply has been submitted to the City of Goodyear for this development.”
 - c. If the development is participating in the Ground Water Replenishment District, the following shall be used in addition to the above note:

“This subdivision is a participant in the Ground Water Replenishment District. As such all land within the subdivision is subject to taxation by the district.”
22. A certification must be provided by a land surveyor registered to practice in Arizona stating that the plat was made under his direction and that it meets the minimum standards for Arizona Land Boundary surveys. His seal must be placed on each sheet of the plat.
23. Sight distance triangles must be clear of landscaping, signs, or other visibility obstructions between 2 feet and 7 feet in height and 6 inches maximum width or diameter.
24. Provide in block form in the lower right hand corner of the plat the following information:
 - a. Land surveyor’s name and address.
 - b. “Plat for (name)subdivision.”
 - c. Date prepared and job number.
 - d. Scale

e. "Sheet ___ of ___ sheets."

25. Other requirements included on the Final Plans Submittal Requirements sheet which is part of the preliminary plat stipulation package must be met.

C. Plats to be Recorded (Including Amended Plats)

1. All the required improvement plans (water, sewer, paving, grading, etc.) must be approved by the City before the plat can be recorded.
2. When the improvement plans have been approved, the plat will be signed by the appropriate City officials to indicate the City's approval, and the City shall cause the plat to be recorded in the Maricopa County Recorders Office.

D. Amended Plats

One of the three following methods shall be used to amend a recorded plat. The developer shall arrange an initial contact meeting to determine the method of amendment. Any replatting or amendment to plats may be subject to changes of ordinance, city codes, or state statutes which may have occurred since the original plat, as determined by city staff.

1. Return to the preliminary plat/final plat procedure (major changes):
This method shall be used when there are proposed changes involving any of the following: Zoning, type of lot, number of lots (+/- three or more), tracts or common area facilities. Any change which substantially alters the original approved plat, as determined by city staff, shall require a preliminary plat and final plat procedure.
2. Replat procedure (moderate changes):
This method shall be used when there are proposed changes involving any of the following: Number of lots (+/- one or two), lot lines (+/-3 feet or more) of more than three lots, roadway alignment, abandonment of public right-of-way vacation of easement, rededication of easements or rights-of-way, third party involvement (i.e. lien holders, financial institutions, property owners association). No preliminary plat is required with this procedure.
3. Certificate of Correction (minor changes):
This method shall be used when there are three or fewer minor changes proposed involving any of the following:

Lot lines (± 2 feet or less) of one or two lots, bearing or distance changes, minor corrections to language of dedication, notes, or legal description. Certificates of correction shall be prepared by the original plat engineer or surveyor.

9.2 SUBDIVISION DEVELOPMENT

9.2.1 General Comments

9.2.2 Refuse Collection Stations - Design and Construction

- A. The City requires that all refuse shall be collected and disposed of by the City. If the City cannot provide the service, a private contractor may be issued a permit to provide the service. For information on schedules and collection fees, contact the Utilities Services Supervisor at 932-1637.
- B. All service and construction of enclosures will be in accordance with Maricopa County Health codes.
- C. All developments shall provide areas for refuse containers per the following guidelines:
 - 1. Single-family subdivisions
 - a. Refuse shall be placed at the curb in approved containers provided by the individual users or the City. Developers shall contact the Utility Services Division, 932-1637, to find out type of collection system being used in their particular area. Arrangements will be made for distribution of Rules and Regulations to new residents.

9.2.3 Waste Control

- A. All developments shall provide for waste control per the following guidelines:
 - 1. Single-family developments
 - a. Swimming pool connections:
 - (1) Swimming pool waste water shall be allowed to be pumped to the sanitary sewer through an indirect drain. Maximum pumping rate shall not exceed one half of the calculated capacity of the receiving sanitary sewer nor 100 gallons per minute.

- (2) Indirect drain connections shall be designed, located and constructed to exclude surface or underground water from the sanitary sewer.
- (3) The indirect drain connection shall provide an air gap, equal to two times the diameter of the waste water discharge pipe, between the lowest opening of the waste water discharge pipe and the flood level rim of the receiving plumbing fixture.
- (4) Swimming pools having a pressure or gravity sand type filter shall be allowed to connect to the sanitary sewer only through an indirect drain.
- (5) Swimming pools having a diatomaceous earth type filter shall be allowed to connect to the sanitary sewer through an indirect drain, only if the diatomaceous earth type filter is equipped with a diatomaceous earth separation tank on the backwash waste water line. All diatomaceous earth or other type filter aids shall be removed from the backwash water before the backwash water may be discharged to the sanitary sewer.

9.2.4 Residential Property Line Walls and Fences

- A. All walls constructed on residential property lines are subject to the following standards:
 - 1. Except at street corners and driveways where line-of-sight requirements govern wall height (See City of Goodyear Exhibit No. 12), walls between single-family residential lots, or between such lots and public alley ways shall not exceed six feet in height, residential lots abutting non residential zone/use shall be six feet minimum or higher if required by the City and shall be constructed of such materials and using such methods that the wall will not constitute a hazard. The appearance of the wall shall meet the standards of the neighborhood, and any substandard wall is prohibited.

2. All walls and fences bordering alley ways where garbage or trash is collected shall provide an indentation into the wall at least three (3) feet deep by eight (8) feet longitudinally and having a minimum vertical clearance of four (4) feet for the placement of refuse cans. Gate swings shall not encroach on the minimum area. Provision may be made to fill the cans from inside the wall, or the indentation may be the full height of the wall. The indented area shall have a concrete floor 3-inches thick, set 1-inch above grade.
3. Masonry walls shall have a reinforced footing of a minimum width of 25% of the wall height and a minimum depth of 8% of the wall height, and shall otherwise be reinforced as a "non bearing masonry wall" under the Uniform Building Code.

10.1 "AS-BUILT" REQUIREMENTS

Right-of-way construction permits will not be released nor any type of construction accepted until certified "As-Built" plans have been submitted to and approved by the City.

10.1.1 Submittals

- A. "As-Built" plans shall be submitted on either mylar or photo mylar (minimum size 22" x 34" maximum size 24" x 36", 4 mil. thickness) and be of a quality allowing microfilming. Digital Mylars will be an acceptable alternate if submitted with a disk or CD copy.
- B. "As-Built" plans shall provide the appropriate approval block for off-site inspection (See City of Goodyear Exhibit No. 6).
- C. "As-Built" plans shall be signed and sealed by a Registered Professional Engineer with the "AS-BUILT CERTIFICATION" approval block (See Exhibit No. 6).

10.1.2 Minimum Technical Requirements

- A. Street Plans
 - 1. Station for all grade breaks.
 - 2. Back of curb offset dimension at all changes in alignment.
 - 3. Top of curb, gutter and pavement centerline elevations at all grade breaks, curb return, valley gutters, plus any other location necessary to adequately show drainage.
 - 4. Survey monuments - installation and accuracy certifications.
- B. Irrigation and Storm Drains
 - 1. Street centerline station and offset dimension to the main at all changes in alignment and/or changes in grade.
 - 2. Street centerline station and offset dimension to all structures and changes in alignment.
 - 3. Top and invert elevations for all structures.

C. Grading and Drainage Plans

1. Elevations at all drainage control points (i.e. retention overflow point, tops and bottoms retention basins, drain rim, valley gutters, curbs).
2. Dimensions of all retention areas.
3. Retention calculations revised to as-built condition.
4. First floor or pad elevations.
5. Location of all existing structures (i.e. buildings).

D. Water Plans

1. Street centerline station and offset dimension to:
 - a. All fire hydrants and fittings (i.e. valves).
 - b. Main at all changes in alignment.
 - c. All horizontal control points (i.e. centerline intersects, P.C., P.T.).
2. Station and elevations given at all vertical alignment changes.
3. Centerline station and offset to each service tap; size of tap and dimension to nearest side property line.
4. Note centerline station, offset and elevations to all changes in vertical alignment (i.e. dips, bends, etc. required to avoid conflicts with other utilities).

E. Sewer Plans

1. Street centerline station and offset dimension from street centerline to main at manholes and all changes in alignment.
2. Sewer line station at centerline of each manhole.
3. Rim and invert elevation for each manhole.
4. Calculated slope between manholes.

5. Sewer line stationing at centerline of each service tap at 90 degrees to main; if not installed 90 degrees to main, station and offset to end of each service tap.